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Carbon Capture and Storage: the solution to climate change or to the fossil fuels' survival? Critically framing EU´s discourses around CCS.

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ABSTRACT

In response to global demands for the phase-out of fossil fuels to address the climate crisis, the fossil fuel industry and the apparatus constructed around it have endorsed various strategies. From outright denial, these actors have shifted to a more subtle form of obstruction characterized by delay tactics and deceptive practices. Through a qualitative frame analysis and critical discourse analysis of European official websites and documents around carbon capture and storage (CCS), three major frames emerged: F1. legitimacy; F2. technological optimism and F3. bridge technology. This thesis argues that the fossil fuel industry, and the structure of obstruction surrounding it, use CCS technology as a delay tactic by disguising it as the main technology capable to phase-in the energy transition. The deceptive use of CCS technology allows the industry to divert attention and resources from renewable energy sources, enabling the reinforcement of carbon lock-in and the strengthening of the incumbents´ fossil fuel regime, while safeguarding their power and hegemony and implicitly denying alternative organizations of society that are not dependent on fossil fuels.

Key words: climate obstruction; hegemony; power; carbon lock-in; CCS, delaying tactics.

"Given today is Energy Day at COP26, leaders are meant to be focusing on how to accelerate the transition away from fossil fuels. (…) *But it's clear that the transition to a clean energy future is going to remain extremely challenging until countries take meaningful action to address the obstructive and anti-science lobbying of vested interests from fossil fuel value chain sectors. (…) The corporate playbook for holding back climate policy has come a long way from science denialism but is every bit as damaging. (…) What we are seeing is not limited to efforts to undermine regulations directly. It also involves prolific and highly sophisticated narrative capture techniques, leading governments down incredibly dangerous paths.(…) The world is starting to wake up to the impact these companies are having through their policy influence.* (…) *In many cases this policy influence massively overshadows the direct climate impacts of their operations and product."*

Ed Collins – InfluenceMap Director

Influence Map press release: The World´s most obstructive Companies on Climate policy 4th November 2021

INTRODUCTION

The greatest challenge of the 21st century is climate change. Human activities, through the emission of greenhouse gases, have unequivocally caused global warming, with the global surface temperature reaching 1.1 degrees Celsius above 1850-1900 in 2011-2020. Significant threat is being posed to the future of humanity and a consistent part of life on the planet (IPCC, 2023).

Since the start of the industrial revolution, almost 250 years ago, the atmospheric concentration of greenhouse gases has constantly risen given the release of billions of tonnes of carbon dioxide from the combustion of fossil fuels. This has led the pertinent scientific literature to affirm a well-established correlation between emissions, concentrations, and climate change. Awareness of climate change has been in the public domain for 30 years, since the publication of the Intergovernmental Panel on Climate Change´s (IPCC) first Assessment Report in 19990. Science almost unanimously states the direct link between climate change and the harming of the planet along with humanity (Grasso, 2022). The oil and gas industry has contributed significantly to the increase in greenhouse gas (GHG) concentrations through the emissions generated by its products and processes. It is therefore possible to consider this industry as a major contributor to anthropogenic climate change. Emissions continue to increase, yet expanded production of fossil fuels is being planned globally.

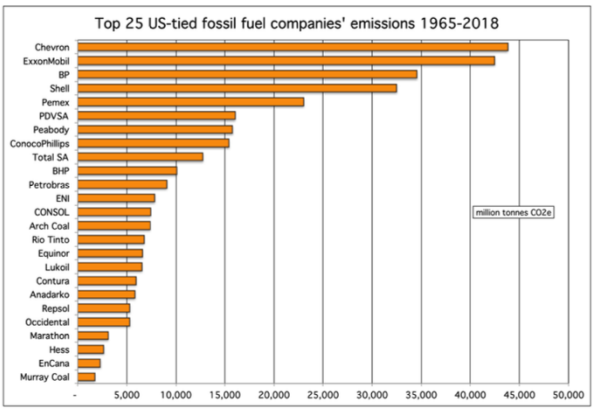
Fossil fuels have a pervasive impact in the global energy production, providing 80% of the world´s total primary energy supply, and supporting the global financial system as a strongly capitalized sector and a heavily prevalent source of economic flow for the world´s banks, insurance companies, and pension funds (RAN, 2020). A petro-market civilization, defines the global market economy (DiMuzio, 2012). Indeed, production, resource extraction, manufacturing, transport, agriculture and food production, revolving around fossil fuels, make extremely difficult to imagine how current societies could be differently organized. Thus, fossil energy, provides a hegemonic understanding of economic development, in a Gramscian way (1971), that exists and perpetuates beyond questions.

The Climate Accountability Institute (Heede, 2020) has quantified how much CO2 the largest oil, gas and coal companies have emitted from 1965 to 2018. The results show that top twenty investor-owned and state-owned oil, natural gas and coal producers, have collectively

contributed 493 billion tonnes (global total of 1.41 trillion tCO2e) of carbon dioxide and methane, primarily from the combustion of their products, which is equivalent to 35% of all global fossil fuel and cement emissions over the period. For instance, 1965 was chosen as a starting point for the dataset after recent research revealing that by the mid-1960s, leaders in the fossil fuel industry and politicians were already aware of the impacts of emissions on the climate. Fig 1. Illustrates the top twenty companies and the percentage of global fossil fuel emissions as well as their assets, operations, production or sales.

Fig.1 Emissions 1965-2018 by Top Twenty investor-owned and state-owned oil, natural gas, and coal producers, and as percent of global fossil fuel emissions (left). Principal compnaies with assets, operations, production, or sales in the US (right).

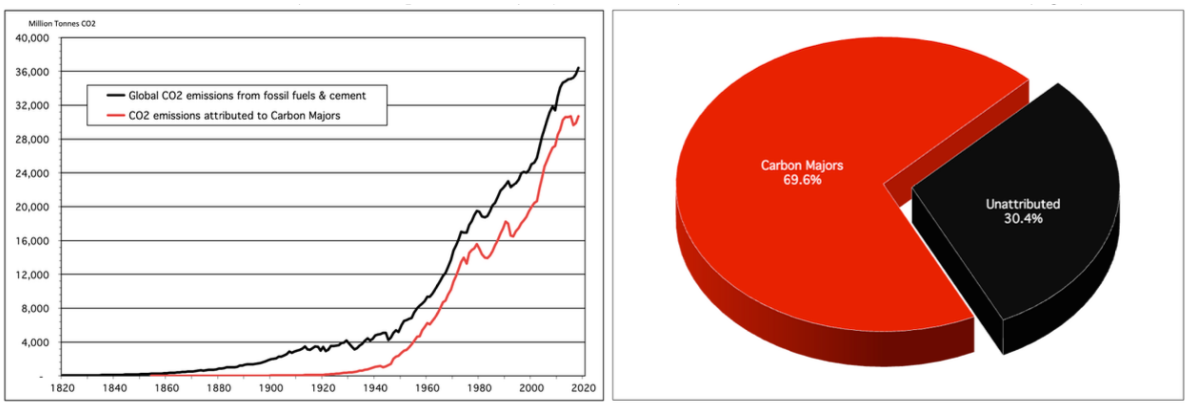
Entity	$MtCO_2e$	% of global 1965-
1. Saudi Aramco, Saudi Arabia	61,143	4.33%
2. Gazprom, Russia	44,757	3.17%
3. Chevron, USA	43,787	3.10%
4. ExxonMobil, USA	42,484	3.01%
5. National Iranian Oil Co.	36,924	2.62%
6. BP, UK	34,564	2.45%
7. Royal Dutch Shell, The Netherlands	32,498	2.30%
8. Coal India, India	24,341	1.73%
9. Pemex, Mexico	23,025	1.63%
10. PetroChina / China Natl Petroleum	16,515	1.17%
11. Petroleos de Venezuela (PDVSA)	16,029	1.14%
12. Peabody Energy, USA	15,783	1.12%
13. ConocoPhillips, USA	15.422	1.09%
14. Abu Dhabi, United Arab Emirates	14,532	1.03%
15. Kuwait Petroleum, Kuwait	13,923	0.99%
16. Iraq National Oil Co., Iraq	13,162	0.93%
17. Total SA, France	12,755	0.90%
18. Sonatrach, Algeria	12,700	0.90%
19. BHP, Australia	10,068	0.71%
20. Petrobras, Brazil	9,061	0.64%
Top Twenty	493,473	34.98%
Global (1965-2018)	1,410,737	100.00%



Source: Heede R. (2020) Carbon Majors 2018 Data Set. 2023. 2020 (released December 2020) https://climateaccountability.org/carbonmajors_dataset2020.html. Updated to 2022 by the author

The Institute's objective of quantifying and attributing emissions to carbon producers and modelling their impact on the global climate is based on the theory that fossil fuel producers bear significant responsibility for the adverse consequences of their products. The key findings from this quantification attribute significant responsibility to the top twenty companies for emitting 539 GtCO2e, or 30% of all fossil fuel and cement emissions since 1751, while analyzing the full dataset, 108 fossil fuel and cement companies emitted 1,259 GtCO2e, or 69.6% of global emissions (Fig. 2).

Fig.2 Global emissions of carbon dioxide for fossil fuel use and cement production from 1820 to 2018 (black) and the emissions attributed to 108 major carbon producers (red).



Source: Heede R. (2020) Carbon Majors 2018 Data Set. 2023. 2020 (released December 2020) https://climateaccountability.org/carbonmajors_dataset2020.html. Updated to 2022 by the author

Fossil fuel companies can therefore be seen as major culprits, and their actions are seen as a major cause of the global crisis. Knowing the root cause of a problem helps to understand how to dismantle it. In particular, the aim of this paper is to shed light on the pervasive, entrenched and suffocating role of fossil fuel companies, which over the years have created an impenetrable network that, even in the current moment of global catastrophe, has no intention of phasing out and paving the way for the phasing in of sustainable alternatives.

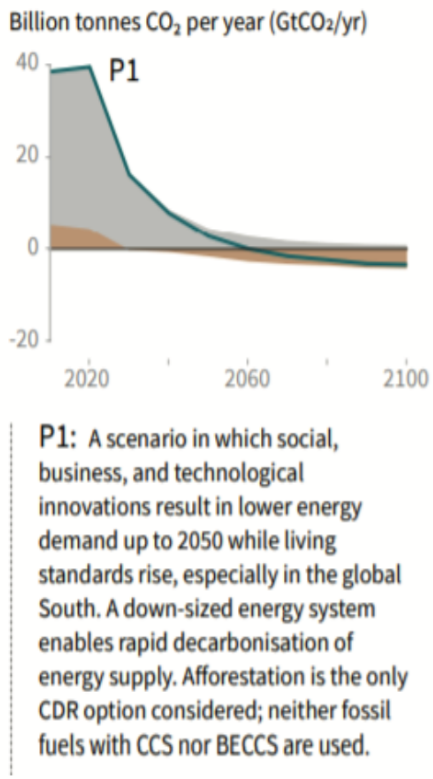
Several actors have seen the introduction of Carbon Capture and Storage (CCS) or Carbon Capture, Utilization and Storage (CCUS) technology as the solution to reduce emissions and meet the ambitious goals of the Paris Agreement.

Swift and decisive action is essential to address the threat of climate change, including the urgent need to phase out carbon-intensive energy production. In a report commissioned by Friends of the Earth Europe, Anderson and Broderick (2017) emphasize the need to phase out fossil fuels completely, stating that they should play no significant role in an EU energy system that aims to limit global warming to 2 degrees Celsius after 2035. Achieving this transition requires a comprehensive understanding of how entrenched interests resist change to the existing status quo. The same point is raised by the IPCC, which notes that the emissions reduction scenario in Figure 3. The scenario with the best chance of keeping global temperatures below 1.5 degrees Celsius is one with limited or no use of engineered carbon capture technologies. The same pathway advocates a rapid phase-out of fossil fuels, while

warning about the safety and cost of storage and the risks of leakage from geological storage and transport infrastructure.

In January 2021, 1500 member organizations of the Climate Action Network (CAN) international, the world´s largest network of climate organizations, adopted a common position not to consider currently envisioned CCS applications as "proven sustainable climate solutions" while urging that CCS "*risks distracting from the need to take concerted action across multiple sectors in the near-term to dramatically reduce emissions (…) government subsidies, loans, grants, tax credits, incentives, and financial support for fossil fuels and technologies that use or otherwise support the continued use of fossil fuels, including CCS, should be phased out as soon as possible"* (CAN, 2021; pp.6).

CCS, by its very nature, allows the underlying activity that generates emissions to persist, albeit with some of the CO2 that would have been released captured. The allure of CCS is being utilized to justify and subsidise ongoing investment in fossil fuel infrastructure. This approach inadvertently perpetuates the emission of CO2 and other harmful pollutants, effectively locking them in for many decades to come. Currently, carbon capture is not financially feasible without the implementation of enhanced oil recovery (EOR) or the production of combustible fuels, which inherently ties the technology to the fossil fuel industry. EOR involves the injection of CO2, whether sourced naturally or captured, into underground oil reservoirs to increase the extraction of oil and gas from depleted wells. Essentially, the waste CO2 from burning fossil fuels is utilized to produce more fossil fuels, perpetuating the unsustainable fossil fuel energy system. It is worth noting that over 80 per cent of CCS capacity deployed to date has been used for EOR (CIEL, 2022).



Despite this acknowledgement, i.e., the recognition that CCS is not a viable option to mitigate climate change, CCS activity in Europe has almost quadrupled since 2019 (GCCSI, 2022).

Fig.3 P1 scenario
Source: IPCC (2018)

At the same time, with the global dominance of neoliberal market capitalism, multinational corporations have gained significant influence (Crouch, 2011). Professor Julia Steinberger, an ecological economist, has highlighted the phenomenon of 'state capture' by fossil fuel industries as a fundamental barrier to climate action. These industries, characterized by their size, profitability, and international presence, possess structural power. Furthermore, they exercise instrumental power by funding lobby groups, political campaigns, and think tanks, a phenomenon known as 'corporate ventriloquism' (Schneider et al., 2016, p. 19) (Klein, 2014).
Over the years, the fossil fuel industry has successfully protected its interests by leveraging instrumental and discursive power. The Climate Social Science Network (SSCN) describes a `structure of obstruction` that generates narratives not only to justify the continued extraction of fossil fuels, but also to perpetuate economic exploitation more broadly.
Strategies employed by the industry to undermine climate science and challenge the anthropogenic causes and impacts of climate change include casting doubt, denial, and ad hominem attacks on scientists (Klein, 2014; Lamb et al., 2020; McKie, 2019; Mann, 2021; Supran & Oreskes, 2021). As the scientific evidence has become increasingly robust, recent studies have identified more subtle tactics utilized by opponents of the climate action. Various forms of 'delay' discourse have emerged from the climate change countermovement, which initially originated in the United States but has now expanded transnationally, including to Europe (McKie, 2021).

A number of scholars argue that fossil fuel companies propose and push for technology developed by their scientific experts as the solution, while overlooking all of the hidden trade-offs that assume opposing position, while convincing stakeholders and policy-makers that these companies are working to improve the environment, when in fact they are working to continue fossil fuel extraction, and thus their survival (Stephens, 2013; Gunderson and Megura, 2022).

By providing an overview of climate obstructionism, from outright denial of climate change to the evolution of the fossil fuel industry´s climate delaying tactics, I aim to present the literature review about obstructionism in the background section, which consists of three further parts respectively: the maintenance of the status quo and the carbon network, which addresse the concepts of lock-in that will appear regularly throughout the text; path dependencies, incumbents, regime, power and hegemonic bloc through a neo-Gramscian lens, useful to understand why high degrees of embeddedness are present in current societies and why is difficult to imagine alternative scenarios, far from an anthropocentric, patriarchal, industrialist

and capitalist ideas utterly entrenched between them. This is followed by a subchapter on the technological innovation system, which provides the basis for considering a technology as capable of innovating the systems and thus causing a transition, in particular how CCS is considered part of these innovation technologies. The thesis is based on the assumption that in order for transitions to phase-in, it is essential to first initiate a gradual removal of the hegemonic bloc, i.e., a phase-out. Phase-out approaches, which have received limited attention thus far, focus on dismantling socio-economic systems that heavily rely on fossil fuels, thereby paving the way for a sustainable future.

Drawing on this literature, using a deductive approach, I argue that CCS technology is largely seen as a niche technological innovation that will enable the phase-in of the transition, whereas the opposite seems to be the case, as I argue that CCS is yet another tactic developed by the fossil fuel regime to perpetuate its existence in the future, and only pretend to engage in climate efforts, making the phase-out even more distant (which given the assumption of first phase-out, then phase-in) and the phase-in even more distant and difficult. My hypothesis, therefore, is that the orchestrated actions employed by the obstructionists, are effective, and result in the obstruction of the phase-in of the energy transition, and the worsening of the climate conditions.

To verify the theoretical part, I dive deep into the context of the European Union. Here, the status of CCS in Europe is provided, along with the EU's strategy on CCS, as outlined in the European Green Deal and the Net-Zero Industry Act, part of the Green Deal Industrial Plan, assessed through the European Union's website. In addition, I analyse the CCUS Forum vision paper, written by the members of the CCUS Forum and considered as a robust stakeholder consultation platform, established by the European Commission in 2021 with the aim of gaining broader knowledge on CCS and guiding decision makers in the deployment of the technology. As the CCUS Forum is used to guide decisions in the EU, I take a deeper look at the members of the working group. However, the CCUS Forum is not the only source of advice for EU decision makers, the Zero Emissions Platform (ZEP) is the other advisor. For this reason, I further investigate the official website of the platform and thoroughly scan its members and report a brief history of the platform in the following findings section.
In a second moment, given the literature used and the analysis of the data, three frames emerged: (1) legitimacy; (2) technological optimism; (3) fossil fuel solutionism.

In addition, through the lens of entrepreneurial activity, which serves as a function to position CCS among niche technological innovations, I will explore where industry's commitment to this technology comes from.

THEORETICAL FRAMEWORK

Climate obstruction

Consistent body of scientific evidence concerning the extent and impacts of climate change exists, and is detailed, conclusive and acute, yet significant policy responses have not been forthcoming, and the radical actions required to tackle the crisis have not been taken. Energy transitions are slow, and the status quo does not seem to be changing.

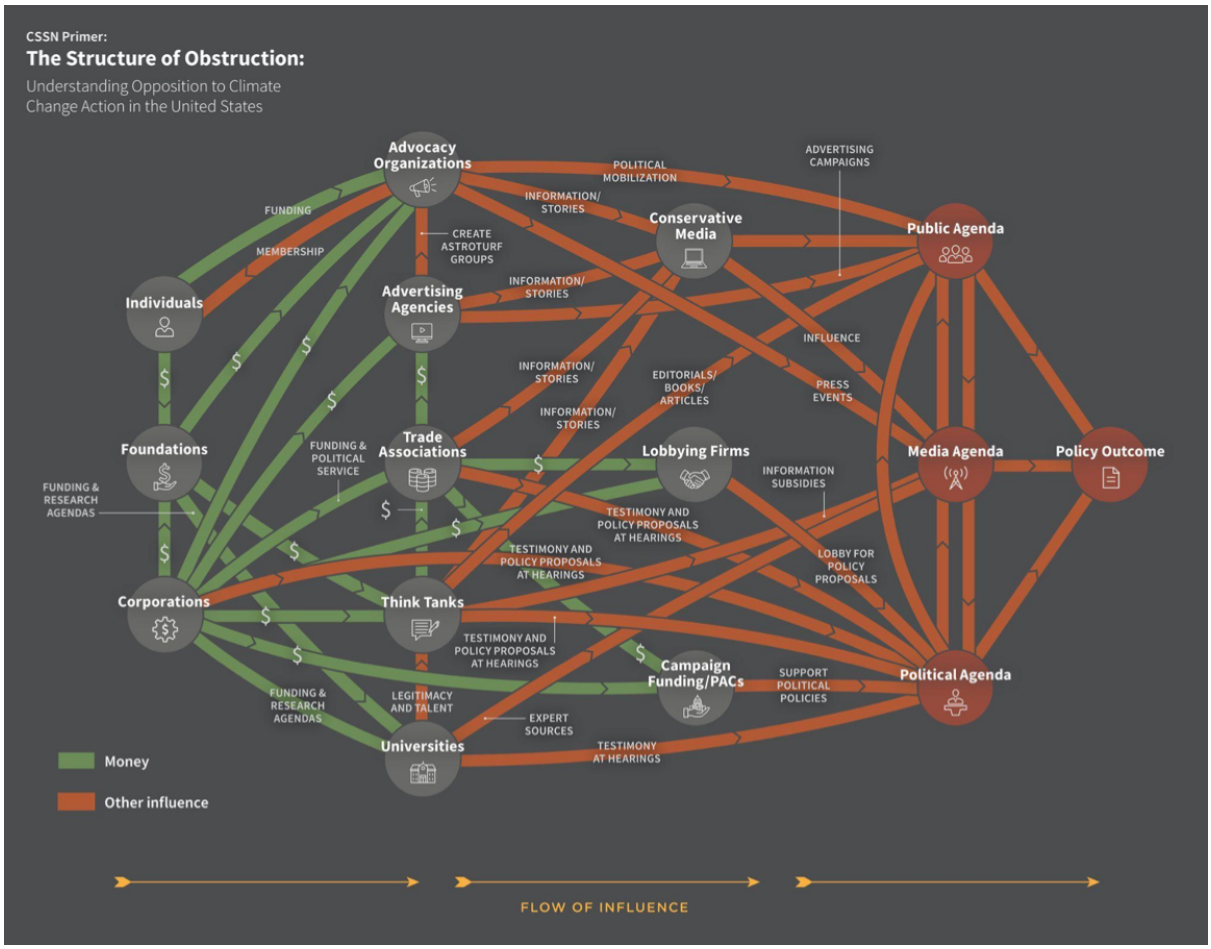
To address this issue, draw in a growing body of scholarship that attributes part of responsibility to the fossil fuel industry and the intricate, highly developed network of organizations built around it to protect its core business and block action on climate change that is inconsistent with the industry´s operations. Their ability to obstruct climate effort, has given them the connotation of obstructionists, sometimes referred to as `denial machine` (Begley, 2007), (the term `denialism`, however, has been used as an ideological umbrella, that ceases to include the current state of actions and therefore suffers from a inaccurate generalization at the moment). The group of obstructionists, that I will refer to in this paper is made up of broader range of actors than the think tanks funded by the oil industry (Dunlap and McCright, 2015).

The literature on climate obstructionism is predominantly from the US context, but a growing body of research (Almiron and Moreno, 2022) in Europe has found similar patterns and, as Dunlap and Brulle (2020) also point out, although it originated in the US, it has spread internationally. Private interests in the perpetuation of the fossil fuel-based economy have been identified as the main drivers of opponents of climate action, embedded in a neoliberal, libertarian ideology (Dunlap and Brulle, 2020). These two ideologies are fiercely interconnected, as they are widely pursued by corporate leaders, and most ideologically driven actors depend (directly or indirectly) on the corporate world for financial support (Brulle, 2014).

Moreover, obstructionists are united by the defence of financial, oligarchic and patriarchal capitalism (Almiron and Moreno, 2022), resulting in a regime of obstruction characterised by a specific political-economic architecture (Carroll, 2020). Empirical research on these networks explores who the key actors are and how they work to influence the public agenda, so that the common sense and public opinion are in line with an anti-climate action. Second, to shape the media agenda and cast doubt on the efforts that need to be made to address climate change. Third, lobbying the political process to opt for anti-climate action.

The group of obstructionists is extremely sophisticated and operates in several institutional arenas through a wide range of tactics part of the "structure of obstruction" (Climate Social Science Network (CSSN), 2021). (Figure, 4).

Fig.4 CSSN The Structure of Obstruction



Source: CSSN (2021)

Ten key players and the various tactics they have employed have been identified by the CSSN (2021):
(1-4 driven by strong economic motivations, while 5-10 by strong ideological reasons)

1. **Corporations and Trade Associations**: individual companies have worked since 1988 (after the formation of the IPCC) to disseminate doubt and misinformation on climate change.

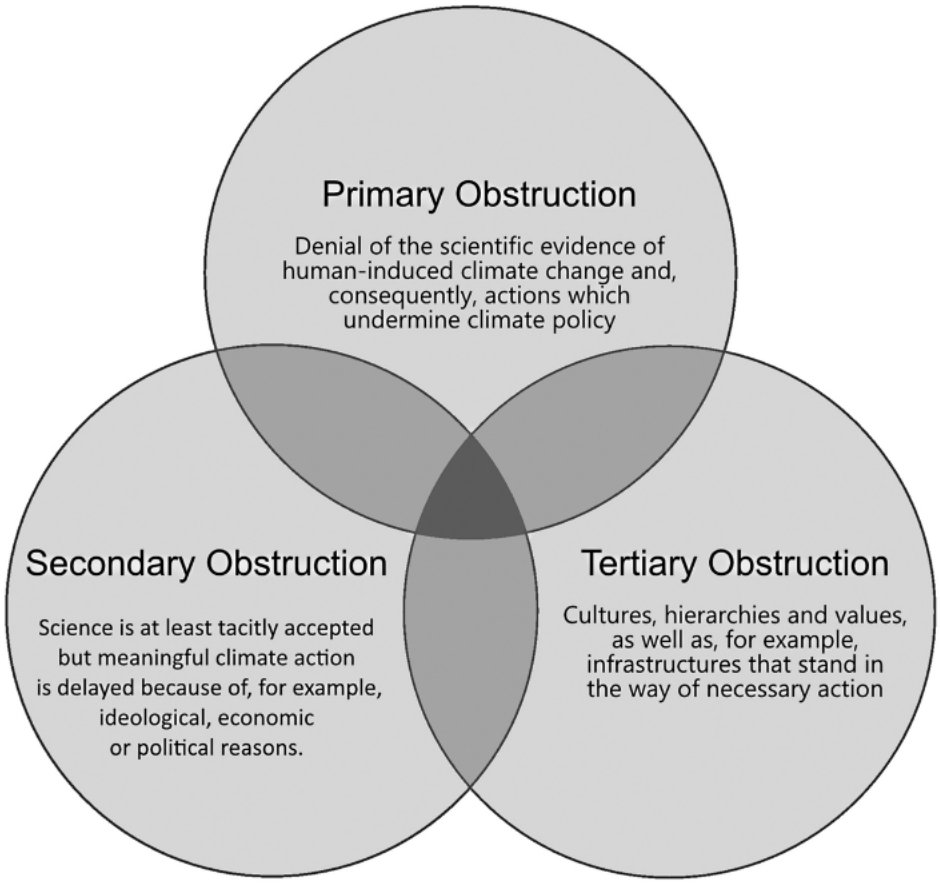
2. **Opposition Coalitions and Front Groups:** many of the above corporations have guided the development of upbeat-named coalitions to coordinate their lobbying and public persuasion efforts to block or retard regulations to reduce emissions and address climate change, by fear of mounting scientific evidence, and negative publicity.
3. **PR Firms:** notably rose together with the concern over global climate change, as a result of partnering with fossil fuels in the development of extensive campaigns aimed at cultivating a favorable public perception for the latter ones and counter climate change mitigation efforts. A pivotal role has been played by these firms in impeding progress on climate action. With them a long and prolific history of sophisticated greenwashing started through a comprehensive use of media outreach (Brulle and Aronczyk, 2019)
4. **Astroturf Groups/Advocacy Organizations:** the collaboration of the three aggregates above explained, established astroturf groups, deceptive entities created for short-term campaigns. They are designed to stimulate widespread grassroots protests by workers and citizens who appear to be against specific climate change mitigation policies and proposals, while obscuring their corporate sponsors.
5. **Conservative Philanthropists and Foundations:** refer to family foundations belonging to political conservatives and business interests provide support for long-term endeavors. Ranging from fundings of think tanks, advances of conservative ideologies within academia, and employment of PR campaigns to promote the merits of free-market principles and foster positive perceptions of corporations. Medium-term initiatives, translating academic concepts, such as rationales for corporate tax cuts, into practical policy proposals that can yield self-sustaining benefits. While, for what regards short-term efforts, there is evidence lobby financing against regulatory measures as well as the orchestration of astroturf groups that give the illusion of broad-based public opposition.
6. **Conservative Think Tanks (CTTs):** a network of major amplifiers of climate change denial and obstruction, that have pushed a wide range of neoliberal policies, drawing on their success of being perceived and treated at the same level as academia, and spokespersons as legitimate experts, who have inundated books, policy-briefs, op-eds with denial, misdirection and misinformation (Dunlap and Jacques, 2013). The institutional base provided by this organizations to leading contrarians is remarkable, and has produced the desired credibility to the public, media outlets and some policymakers. The CTTs range from large multi-issue ones like the Heritage Foundation

and American Enterprise Institute, to medium ones such as the Heartland Institute which claims a robust interest in environmental/ climate issues (McCright and Dunlap, 2003)

7. **Contrarian Scientists:** only a small number of scientists helped in the promotion of climate change denial, due to the disproportionate representation (sustained by the journalistic norm of `balanced reporting` (Boykoff, 2011)) they acquired in mainstream and particularly right-wing media. The possession of a PhD in fields such as physics, geography, soil science and economics, and regardless of the quantity and reliability of their records and publications, have enhanced their trustworthiness in the broader public stimulated by vast CTTs media access (Oreskes and Conway, 2010). They have promoted uncertainty about climate change, through a direct attack of the entire field of climate science and climate scientists (Powell, 2011).
8. **Conservative Media:** considered the largest echo chamber able to amplify climate obstruction, through the generation of the notion that climate change a scientifically controversial issue, despite the strong scientific consensus on human-caused global warming, hence prolificating skepticism on many levels.
9. **Republican Politicians:** actions such as reducing carbon emissions, do not align with the Republican party´s long term embracement of free market and anti-government ideology. Republican Administrations have actively worked towards the minimization of the risks posed by climate change through the blockage of amelioration actions, the elimination of climate science programs and cut of fundings, as well as obstructing agency oversight by installing deniers in important positions (Turner and Isenberg, 2018).
10. **Denial Bloggers**: emerged after 2000 with the growth of the blogsphere, facilitated the chances to create and distribute climate change misinformation, which led to numerous blogs and websites marked by skepticism towards climate science, leading to the international diffusion of obstruction.

To better understand the dynamics hindering efforts to end the burning of fossil fuels, the authors of `Climate Obstruction: How Denial, Delay and Inaction are Heating the Planet` (2022), have proposed an illustrative scheme divided in three intersecting parts.

Fig.5 Climate Obstruction



Source: Ekberg, K., Forchtner, B., Hultman, M., & Jylhä, K. M. (2022). *Climate Obstruction: How Denial, Delay and Inaction are Heating the Planet*. Taylor & Francis.

In doing so, Primary Obstruction highlights the role of industries, organizations and affinity groups that have forcefully put barriers to meaningful action on climate change, ranging from outright denial of the scientific evidence of human-induced climate change, since the establishment of the IPCC in 1988, until the comparatively recent role played by the far right. Secondary Obstruction includes all those activities and claims that, while not denying the human-induced nature of the climate crisis, delay or hinder significant climate action. Finally, Tertiary Obstruction refers to all those processes by which often well-meaning individuals and collectives live in denial, highlighting societal structures that make it extremely difficult to mobilize popular engagement and support for effective climate solutions, extremely difficult.

The authors (2022) also argue that obstruction stems from identity processes and exposure to disinformation, and that these attitudes are influenced by both top-down and bottom-up factors, that don´t act separately but also interact with each other. Furthermore, a general tendency to politicize climate change reflects a high degree of solution aversion, where forms of mitigation behavior and policy proposals collide with the view of the ideal society and policy, which in a broader dimension seems to result in a general dislike of all types of climate discourses, which in turn explains climate obstruction in almost all the three forms considered by the authors. Accordingly, there is an interplay between the individual and the system at all levels of obstruction: at the primary level, the denial machine and disinformation; at the secondary level, political debates and identity processes; and at the tertiary level, the manifestation of societal structures and norms.

High degrees of embeddedness are central. Tertiary obstruction constitutes in this thesis a bridge with a broader understanding of anthropocentric, patriarchal, industrialist and capitalist ideas and values that have been historically constructed and entrenched in our society, justifying the construction or maintenance of infrastructures in the contemporary world that suffer from the ability to imagine alternatives or the large-scale adoption of already existing, few.

Rejecting the importance of these measures due to cultural and ideological motives aligns with the concept of implicatory denial outlined by Stanley Cohen (2013). In general, individuals in Europe possess an understanding of the climate issue and do not outright deny its existence. However, they do deny the consequences associated with it, including the behavioral modifications required to match the urgency of the climate crisis. This denial arises from a desire to maintain certain privileges that scientific evidence has proven to be environmentally unsustainable. These privileges are often rationalized by appealing to arguments deeply rooted in tradition, culture, or ideology (Ekberg et al., 2022).

It is important to also report on the discourses of climate delay (Lamb et al., 2020), that have emerged from these obstructionist actors- indeed, thanks to the Structure of Obstruction, these discourses emerge from fossil fuel companies and evolve and change through an interaction between and among individuals, states, media, corporations and other entities (Pringles and Robbins, 2022). Indeed, the industry has been successful in protecting its interests because of the instrumental or discursive power [1] it has overly used over the years (Monbiot, 2017).

[1] As global dominance of neoliberal market capitalism has expanded, multinational corporations have gained increasing influence (Crouch, 2011). This influence has become so significant that Professor Julia Steinberger, an ecological economist, highlights the phenomenon of "state capture" by fossil fuel industries as a fundamental factor behind climate inaction. The

A study by the University of Cambridge (Fig.3), has deductively identified an extensive list of climate delay discourses examined in surveys, community workshops, media sources and advertisements, in lobbying activities and policy discourses in Europe and US. The authors (2020), have observed that those kinds of intractable obstacles used in the discourses are repeatedly found across sources, actors and contexts. Four questions are based on the four categories into which the climate discourses have been grouped. (1) Is it our responsibility to take actions? (2) Are transformative changes necessary? (3) Is it desirable to mitigate climate change, given the costs? (4) Is it still possible to mitigate climate change? The resulting four groups, as shown in Fig. 6, are: “redirect responsibility”, “push non-transformative solutions”, “emphasize the downsides” of climate policy and “surrender” to climate change.

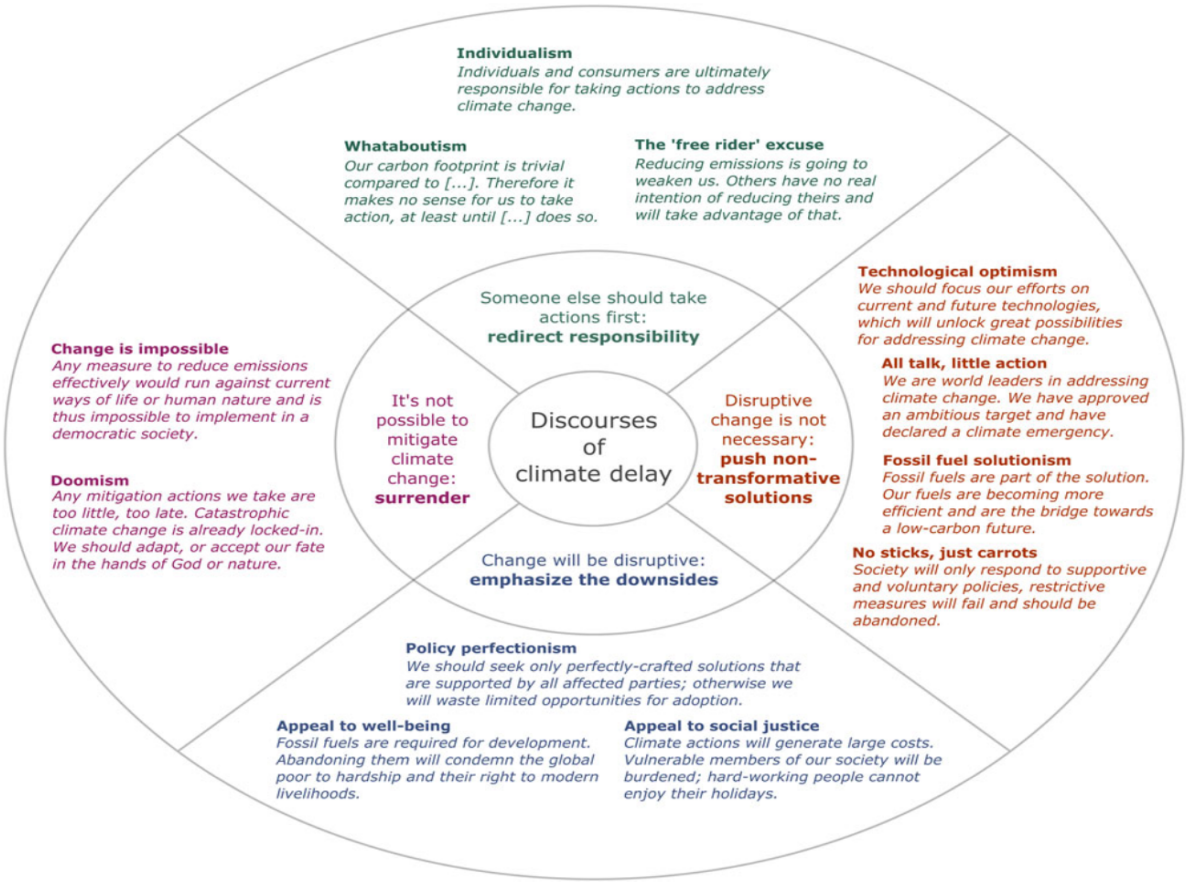


Fig.6: Lamb, W. F., Mattioli, G., Levi, S., Roberts, J. T., Capstick, S., Creutzig, F., Minx, J. C., ... & Steinberger, J. K. (2020). Discourses of climate delay. *Global Sustainability*, *3*, e17. doi:10.1017/sus.2020.13.

substantial size and profitability of fossil fuel companies, coupled with their extensive international presence, grant them structural power. Additionally, their consistent financial support of lobby groups, political campaigns, and "think tanks" exemplifies instrumental power (Klein, 2014). This combination of factors ultimately leads to what is referred to as "corporate ventriloquism" (Schneider et al., 2016, p. 19).

For the purposes of this thesis, attention will be focused on the second discourse tactic of climate delay in order to consider the discourses around CCS technology in the European context. "Push non-transformative solution" refers to policy statements that promote ineffective solutions, far from substantial measures, narrow effective action and have been envisaged in: technological optimism, fossil fuel solutionism, all talk, little action and no sticks, only carrots. Prospects of technological optimism frame climate change mitigation in a positive and optimistic light, diverting attention from (short-term) regulation of fossil fuels and emphasizing (long-term, uncertain) future technological change. It has been presented in many variations: first, past transitions of technology systems and recent improvements in renewable energy deployment. Secondly, and more specifically, the construction of technological 'myths' (e.g. zero-carbon aircraft, fusion power and direct air capture of greenhouse gases) (Peeters et al., 2016). This strategy covers public and media debates by constantly asserting that a low-carbon technological innovation will emerge in a few uncertain years. This empirically unsupported tipping point is presented as imminent enough to discourage other forms of climate action, yet distant enough to justify why it has not yet happened. A third variant of this strategy is to promote the low or declining carbon intensity of current technologies, ignoring the growing demand for these products and the associated absolute emissions (Lamb at al., 2020). UK Health Secretary Matt Hancock states *"We should use technology to reduce carbon emissions for instance electric planes are a potential in the not too distant future "Flying has already decarbonised and can decarbonise more"* (Bloom, 2020).

The second strategy of non-transformative solutions is what the authors call fossil fuel solutionism, and it claims that fossil fuels, with the help of technological means, are part of the solution, and it relies at the centre of the industry relief from regulation (Lamb et al., 2020). Similar to discourses of technological optimism, this narrative addresses to specific areas of progress, such as reducing emissions from fossil extraction and production, investing in "cleaner fuels" and "bridging fuels" such as gas, and developing carbon capture and storage. "*By eschewing regulation, America has also spurred additional emissions-reducing innovations in the private sector. Freed from red tape, U.S. energy firms have been able to devise and implement a host of ground-breaking green technologies. [...] While the rest of the world fumbles with green energy policies, the U.S. continues to reduce emissions. We don't need regulation to guarantee future success. American firms will continue to combat climate change, as long as we let them"* (Drew Johnson, 2020 Senior Fellow at the National Centre for

Public Policy Research). the underlying rhetorical strategy is to emotively link fossil fuels' products to everyday activities and human well-being (Sheehan, 2018).

All talk, little action is another strategy that Big Oil or even countries deploy, which consists in narrowing the definitions of success in order to declare their leadership in the fight of climate change. Setting ambitious targets or positioning themselves as leaders in reducing emissions goes in this direction, detracting the necessity of draconian or innovative action (Gillard,2016). This strategy both touts actual historical reductions in greenhouse gas emissions and emphasizes broad target-based commitments. In this way, it satisfies the public demand that ′something must be done′, while failing to take concrete action. *"The UK has a world-leading record in tackling climate change. We are rightly proud of our performance against our carbon targets, having overperformed for the second time, leading us to cut our emissions faster than any G7 country. We remain firmly committed to tackling the threat of climate change and to meeting our future carbon targets through the ambitious plans and policies set out in the Clean Growth Strategy*" (Chris Skidmore MP (UK), response to a parliamentary question from Caroline Lucas)

No sticks, just carrots, is positioned on a more ideological level and suggests that climate action should be pursued exclusively through voluntary policies (carrots) notably those that extend consumer choice, such as funding high-speed rail to substitute flights. On the other hand, any kind of restriction, regulation or financial disincentives (sticks), are seen as burdensome and too paternalistic for the population. This argument stands in stark contrast to the complementary necessity of both "carrots" and "sticks" in a bold climate policy (Lamb et al., 2020). The German Free Democratic Party represents a remarkable example of this rhetoric- *"The environment minister wants to increase taxes on flights. Why not make the railways more attractive instead?"* (Christian Lindner, leader of the Free Democratic Party in Germany, Twitter 18 July 2019), and it continues with its climate plan- *"We put emphasis on the innovative capacity of competition. Innovative approaches and new technologies are key for climate action. Greater efficiency reduces energy, resource use, and emissions, while improving quality of life (...). We don't prescribe sustainable behaviour through regulations, we put our trust in the citizen's sense of responsibility".* Entrepreneurial values, narrow success definitions and positive settings protrude above transformative efforts and leverage unsustainable activities (Lamb et al., 2020).

Maintenance of the status quo

The complex, interrelated actions of these different obstructionists coordinate their efforts with the ultimate goal of maintaining the status quo, which is incompatible with life on Earth in the near future. In order to complete the previously presented scheme of climate obstruction and better comprehend why transitions are obstructed, neo-Gramscian theory and the role of power and incumbency are presented.

Transitions often refer to a change in the state of a system, and can be understood as a radical shift, not just in single factors such as a technology or fuel source. Rather, when applied to sustainability challenges, it refers to societal responses that combine social, economic and technical elements of finance and innovation, technologies, infrastructure, regulation, cultural change and social pressure, all working together to disrupt and displace the previous way of doing things (Newell, 2021). Regimes are composed by a complex of practices, regulatory requirements, institutions, and infrastructures, necessary to attain certain societal functions such as housing, mobility, and power (Geels, 2002). This is a useful starting point for better understanding the role of the incumbent actors involved in fossil fuel energy systems, who maintain a structural dominance in energy investment and policy, leading to lock-ins and path dependencies, as they shape the actual spaces available for the expansion of alternatives.

Understanding who the actors in these processes are, and how the forms of power that they wield enable or hinder transitions in energy systems, i.e., who the obstructors are and how they obstruct transitions, is the main focus of this paper.

Systems that tend to stabilize are regarded as successful, meaning that the regimes have a relatively stable configuration of institutions, techniques and artefacts, rules, practices and networks that determine, what becomes the prevailing development and use of technologies (Smith et al., 2005). The activities of regimes in turn promote both lock-ins and path dependencies (Unruh, 2000), towards certain forms of dominant energy sociotechnical configuration, while locking out others (Newell, 2021). When alignments between the three levels occur, structural changes are expected, resulting in transitions, so that the way in which regimes, niches and landscapes interact will have an impact on the contours of the transition. These alterations typically allow for the increasing influence and development of niches as sociotechnical configuration on the one hand, and the disintegration of the regime configuration on the other.

Transitions studies are largely characterized by a focus on the phase-in of renewable energy sources to enable the energy transition. However, there is a prior step that paves the way for the phase-in, and that is the phase-out of the current energy sources, which is partly overlooked by transition scholars. Without a substantial phase-out, any kind of transition can only be imagined chances to materialize cease.

Phase-out is to be understood as a policy intervention, according to Rosenbloom and Rinscheid (2020), and it is increasingly proliferating in academia. The policy interventions that support the phase-out deliberately seek to end one or several socio-technical elements, both in a gradual or stepwise process, often characterized by a time horizon. The progressive process of decline, which is the main feature of the phase-out (as opposed to abrupt change), provides societal actors the time to adapt and minimize unwanted disruptions to industries and supply chains, by granting the time to adjust business models, consumption patterns and develop alternatives. It can be understood as a form of discontinuation, marked by strategies aiming to abandon or dismantle existing socio-technical systems, or as a targeted driver of systemic change (Stegmaier, 2023).

There are several reasons to focus on phase-out for the decarbonization approach, two of which will be explained. The first is that carbon-intensive technologies and infrastructure, such as power plants, factories, buildings and vehicles, extend their operational lifetimes over several decades while emitting CO2, exceeding the remaining 1.5 °C carbon budget, unless they are retrofitted or decommissioned prematurely (Trout et al., 2022). Therefore, they undergo a phase-out process.

Carbon-intensive assets are nonetheless intertwined with sunk investments and driven by self-preservation efforts made by the industry, which will not act to accelerate downscaling without a policy intervention (phase-out) as it goes against the defence of the business (Trencher et al., 2022). Second, as argued by Goulet and Vinck (2015), curtailing the production and use of carbon-intensive technologies and arrangements can advance the market shares for cleaner alternatives. Phase-out interventions are therefore necessary to allow the phase-in of production and diffusion of sustainable replacements. In the specific context of climate change mitigation, the application of phase-out has increased in recent years and it includes fossil fuel extraction, internal combustion engines and fossil fuel subsidies (Trencher et al., 2022). This expansion of phase-out is also reflected in the Sixth Assessment Report of the IPCC (2022), that mentions it as a necessary requirement to meet the Paris Agreement´s temperature targets.

The phase-out approach lies at the basis of this thesis, as the hegemonic bloc constituted by the fossil fuel industries and the apparatus they have been able to build around them, is considered as an obstruction to the phase-in and the general action on climate change.

Nevertheless, there are limitations that I recognize in this work, which is unable to account effectively for the global political economy of energy transitions due to the barriers imposed by the body of scholarship consulted. Indeed, this thesis is intended to be read and understood with the following limitations in mind. First, theorizing around transitions has a strong Eurocentric orientation, that marginalizes global experiences or the relationship between transitions (Newell, 2021). Structures of energy provision, such as electricity and transport, don´t differ much across Europe, in addition of being heavily regulated, and energy governance has not experienced crisis of outages and outdated grids. However, this isn´t the case in other parts of the world, where universal access to energy is not a given and several forms of energy provision operate simultaneously. Furthermore, liberalization of the electricity sector has occurred almost all-over European countries, whereas elsewhere, state control over the energy sector is still firmly in place (Newell, 2021). As Lennon and Scott (2017) remark, transitions in Europe and elsewhere are often contingent upon both historical (often colonial) and contemporary practices of extraction and disruption elsewhere. This also leads to a partial historical understanding of the material and social underpinnings of transitions in terms of finance, exchange and flows or raw materials, that have enabled the development of new infrastructures for energy, transport and housing, among others.

Second, what seems to be lacking, is a broader understanding of how national transitions and choices of pathways have global repercussions (Selby, 2019). Additionally, Europe´s dependence on resources and outsourcing of solutions to other parts of the world, is often neglected, as is the impact of the use of biofuels in transport and land use and access in southern Africa, or the rise of electric vehicles and their impact on conflicts over rare minerals in parts of central Africa (Sovacool, 2019), or the use of carbon offsets for projects in the global South is not taken into account (Newell and Bumpus, 2012).

Third, the emphasis on technology within transitions, implies a tendency of supposed greater ability of bottom-up, niche-led innovation, capable to bring about change, while there is a deficiency in recognizing the powerful landscape or regime stakeholders, such as multinational firms, whose behavior, as Newell and Bulkeley (2017) remark, cannot be adjusted by the state in many places.

In this regard, Newell (2021), claims the need to introduce political economy into the sociotechnical literature, so that how, where and why transnational actors shape the regimes, landscapes and niches of energy systems, along with their implications, can be better understood. Furthermore, an integration of techno-economic frameworks with the sociotechnical perspectives that make it clearer to see which decision-makers choose one path over another, thus capturing inertia, path dependencies and lock-ins.
In fact, the hyper focus on niches, and their conditions of emergence, as well as modes of service provision, has obscured the immense role of incumbents and a lack of research on how to manage or accelerate the decline of these incumbents (Turnheim and Geels, 2012). Indeed, a deeper insight into the unquestioned positions of these incumbents, as highly embedded in the current societies, plays an important role and will be further explored.

Of particular relevance is also the need to challenge the narrow framing of "transitions in neoliberal terms as a realignment of technology, finance, infrastructures and institutions, where business as usual power configurations persist, others prefer the language of transformations to distinguish more discrete realignments of sociotechnical functions and service provision from more disruptive and deeper change that seeks to chart a different direction, pursue different goals and consciously unsettle existing power relations" (Newell, 2021; pp. 36). There is in fact, the introduction of trasformismo, which represents the tension between a surmounting recognized need for transformation and the ability of incumbent actors to restrict the debate to questions of incremental transition (Newell, 2019). Through a Gramscian lens, the concept of trasformismo depicts a process of co-optation that "serves as a strategy for assimilating and domesticating potentially dangerous ideas by adjusting them to the policies of the dominant coalition and can thereby obstruct the formation of organised opposition to established social and political power "(Cox 1983; pp.166-7). Indeed, adopting Gramsci´s insights on hegemony for this work, the combination of ideologies, institutions and material sources of power assists the maintenance of the status quo in the current world order, in addition to accommodating pressures for more far-reaching change. This seems to be the strategy adopted by capitalists to claim that energy challenges and the climate crisis can be addressed by market society without disrupting its basic organization and imperatives (Newell, 2021). It is now useful to think about transitions in terms of pathways, and how these pathways are determined over time by the changing, interacting, social technological and environmental configuration of these elements.

As Leach et al., (2010) argue, pathways to sustainability are negotiated, not only by presenting a plurality of options, but also by political processes of creating pathways, that are locked out, hidden, obscured and suppressed, by the exercise of powerful incumbents.

In order to understand where power comes from, how it is maintained and reproduced, the Gramscian lens is briefly combined with the technological innovation system for the scope of this work, as CCS technology is seen as a niche technology able to disrupt the regime (Nurdiawati and Urban, 2022. In this regime, incumbency is indeed grasped as a deeper, locked, system of power. CCS technology is in fact considered as a socio-technical niche because of the following characteristics. It is a conglomerate of new and existing technologies that have not yet been deployed on a large scale. It is also supported by several actors and constituencies that manifest increasing expectations. The technologies are still under development, and their domains of application are still uncertain (Vergragt et al., 2011). However, the biggest difference, that distinguishes CCS from other niche technologies is that it is driven by the established fossil fuel regime.

Levy and Newell (2002) developed a neo-Gramscian political economy framework based on the alliance between policymakers and incumbent firms, which are seen as hegemonic and highly dominant when legitimised by civil society. Cases of incumbent actors orienting towards and incremental and radical niche-innovation, are present, however, they do not amount to a shift in the basis of their power. The example can be found in the fossil fuel industry, which is active in niche innovations such as renewable energy projects and carbon capture and storage.

Indeed, the reproduction of legitimacy of a particular set of interests, according to the neo-Gramscian perspective, is in the hands of the civil society, given its relative autonomy from industry and government. Furthermore, hegemony is contingent and unstable, suggesting that agency and strategy can challenge dominant actors with greater resources. According to Newell and Paterson (2010), contemporary governments are carbon-centered and function through calculative practices that are simultaneously totalizing (aggregating social practices, overall greenhouse gas emissions) and individualizing (producing reflexive subjects who actively manage their greenhouse gas practices). The relationship between energy, employment and growth, through the powerful narrative highlighted by incumbents, shuts down alternative pathways while legitimizing their role.

The role of power thus acquires particular relevance, hegemony and socio-technical regimes work together, and are useful in this thesis to comprehend the obstruction of climate action. Hegemony refers to "the persistence of specific social and economic structures that systematically advantage certain groups" (Levy and Newell, 2002; pp.84). While socio-technical regimes refer to "the locus of established practices and associated rules that enable and constrain incumbent actors in relation to existing (socio-technical) systems" (Geels, 2014; pp.22).

Within international relations' scholarship, oil hegemony has come to play a central role, particularly the projection of oil industry interests through state power, including the use of war to acquire or secure access to resources critical to energy regimes. They enable and stabilize regimes through the exercise of material, institutional and discursive power, necessary for hegemony (Ford and Newell, 2021).

For instance, material power derives from control over production and finance, through the deployment of physical, human and financial resources and the provision of essential goods and services; through these exercises, the core imperatives of the state are reinforced by actors able to generate and reproduce the conditions for capital accumulation. Subsequently, structural power is often a function of a sector´s contribution to securing economic growth, which in the case of the energy industries has allowed them to claim that their interests are aligned with those of capital in general. Businesses often claim that strict decarbonization measures in one jurisdiction will force energy companies to relocate elsewhere, but the effectiveness of this threat is highly variable. Electricity generators and network operators possess less structural power in terms of capital flight, but their ability to provide cheap electricity and maintain competitive prices aligns with the broader goals of the state, making their interests compatible (Ford and Newell, 2021).

Second, in combining hegemony within socio-technical regimes, Ford and Newell (2021) focus on institutional power, which derives from material power, and can be exercised formally through access to key decision-making bodies and processes, but also informally through industry events, professional networks, and personnel exchanges through secondments and revolving doors. An example of this can be found in the fossil fuel political donations in the US, during the 2017-18 midterm election cycle, in which fossil fuel interests donated at least USD $93.4 million to federal candidates, parties and outside groups (Kirk, 2020). This interest

is dual: in December 2019, Kotch (2020) reported that 134 members of Congress and their spouses had between $33.3 and $92.7 million invested in oil, gas and coal stocks.

The third power raised by the authors (2021), discursive power, enables the approval of hegemonic projects and may be exercised directly through public relations, advertising and media engagement, and indirectly through the media and civil society organizations. Significant PR budgets, media advertising and social media, are employed by incumbent firms to shape the delineations of public and political discussion around energy features, in accordance with PR Firms of the Structure of Obstruction (Fig. 4).

As a matter of fact, the oil majors' spending on issue framing and advocacy often exceeds their expenditure on renewables. As reported by Holden (2020), five major oil companies over the past 30 years, have spent at least USD $3.6 billion on advertisements alone, in order to steer the conversation, and dominate the discourse. Similarly, the gas industry has heavily invested in a marketing strategy that has succeeded in driving the conversation around the importance and necessity of configuring gas as a bridge from fossil fuels to renewables in the power sector (Newell and Martin, 2020).

The authors (2021) state that the dominant system can be supported by legal, institutional and economic frameworks that perpetually benefit electricity regime actors. Legal frameworks can be regulatory barriers to the generation, transmission distribution and retail of electricity. The second, the institutional framework, refers to how the incumbents can benefit from privileged access to politicians, civil servants and policy making processes, as in the case of lobbying. Finally, the economic framework helps incumbent electricity firms, through tax breaks, subsidies and procurement processes, as they can control the market access of competitors. (Baker et al., 2014). In this same view, also research and development grants may support incumbents, the Australian Government for example, from 2003 to 2007 committed over AUD $3.5 billion and distributed over $1.3 billion taxpayers' money into a wide range of carbon capture and storage projects, initiatives and programmes, with the ostensible aim of reducing carbon emissions from burning fossil fuels. However, R&D activities never demonstrated the viability at scale of these projects, instead they resulted in the reinforcement of legitimacy of fossil fuel incumbents in tackling climate change and diverting resources away from R&D into niche renewable energy technologies (Browne and Swanne, 2017).

The interrelation between incumbent firms, policymakers and civil society organizations, is useful to better understand the role of power and politics. In this regard, the concepts of historical bloc and integral state are explored from a neo-Gramscian perspective. Gramsci

assigned to the group of actors in a hegemonic position, the notion of historical bloc; more broadly, this historical bloc can include the core alliance between incumbent firms and policymakers on the basis of a mutual dependency that emerges in the regime and becomes strong enough to effectively resist change (Phelan et al., 2013).

Levy and Egan (2003) write that the actors in the historical bloc employ various means to maintain their position, including "the coercive and bureaucratic authority of the state, dominance in the economic real, and the consensual legitimacy of civil society", thus securing or locking-in certain policies while other options are locked-out.

Later on, the fossil fuel was added to the term to cdenote the incumbent actor par excellence; in fact, the "fossil fuel historical bloc" refers to fossil fuel corporations that systematically benefit from carbon-dependent economic growth. Ford and Newell (2021), underline how the historical bloc can be applied to Western contexts at national and sub-national levels.

Second, there is the concept of the integral state, which balances coercion and consent, encompasses both state and private institutions, and it is fundamental in democratic societies to ensure that all individuals are subject to the same laws and regulations, regardless of social status or position. It limits the power of the government. Meanwhile, civil society institutions, such as schools, the press, churches, political parties, trade unions, and associations play a crucial role in upholding these laws. In other words, the integral state corresponds to the intertwined practices of political and and civil society (Ford and Newell, 2021). In this light, civil society doesn´t behave as apart from the state, and secondly everything in society seems to be far from the mere reduction of seeing it as belonging to the state and serving its interests.

Neo-Gramscian scholars see civil society as a complex network of various organizations, including educational, religious, and media institutions, trade unions, and other voluntary associations. These organizations are seen as playing a crucial role in shaping public opinion and maintaining the support for either the existing social order or for a new one that challenges the status quo. Working both individually and collectively, these groups can influence and shape discourses towards a more active and engaged citizenry. The neo-Gramscian perspective sees civil society as a dynamic and contested arena, where different groups and interests compete for influence and power, often leading to conflict and struggle. Reason why, this perspective envisages civil society as a crucial component of socio-political change, capable of shaping the direction and trajectory of society as a whole (Levy and Newell, 2002; Fonseca, 2016).

A neo-Gramscian ´war of position´ refers precisely to the regime resistance to address power dynamics in sustainability. Originally, the term was used to describe counter-hegemonic moves

by subordinate groups coordinarting multiple sources of power to gain allies and influence. However, as neo-Gramscians acknowledge, the same strategy can be employed by dominant groups to maintain their hegemony. Consequently, a war of position can be viewed as a continuous process of social contestation, in which different groups fight for power and influence. The resistance, once again, is manifested through the exercise of material, institutional, and discursive power, as outlined above.

The strategies that incumbent firms and their industry organizations can employ are diverse and they can wield different combinations of power, including alliance building, issue framing and lobbying (Ford, 2020). Fossil fuel companies have largely adopted all sort of strategies, like building issue-specific coalitions that cross sectoral and geographic limitations and reach into civil society, they have also created fake green `astroturf´ organizations, such as the Information Council for the Environment and the Global Warming Policy Foundation. Through these civil society organizations, a façade of great civil society support is created, without this being the case. To this end, some have organized protests against environmental protection measures, many of which were attended by employees of member companies (Levy and Newell, 2002).

Ultimately, the resistance and war of position through the neo-Gramscian lens constitutes the basis of the previously described structure of obstruction. As a matter of fact, a strategy of resistance that can be found in the engagement of these actors is the construction and spreading of issue frames in which they advance their perspective by promoting it in public arenas in order to shape the opinions of others and generate wider support for their view or proposal. Fossil fuel companies have framed global warming in a less urgent way, using fake green organizations to disseminate issue frames of doubt, confusion and uncertainty about the science of climate change (Dunlap and McCright, 2012).

A third strategy of regime resistance is lobbying against state policies that support niche development, as was the case in the European Union, where between 2011and 2013 oil and gas interests undermined EU renewable energy targets in favor of gas (Caldecott, 2018).

In an example illustrating a strategy aimed at reducing support for niche competitors, lobbyists representing ExxonMobil exerted pressure on the EU Commission to repeal the stringent CO2 emission standards for internal combustion engines. This effort was intended to delay the advancement of electric vehicles (Davidson, 2020). Regime firms also engage in lobbying against government policies that respond to ´landscape´ pressures such as climate change. Between 2000 and 2016, lobbying expenditures on climate legislation in the US amounted to

$2 billion, with the overwhelming majority of spending coming from sectors associated with fossil fuel production and consumption. This significantly overshadowed lobbying spending by the renewable energy sector and environmental organizations by a ratio of 10:1 (Brulle, 2018). In fact, as incumbent power faces greater threats, more resources are devoted to maintaining it. With the prospect of more ambitious policy changes in the wake of the Paris Agreement and the IPCC Special Report on Global Warming of 1.5°C (IPCC, 2018), which calls for transformative systemic change, resistance efforts have intensified. Fossil fuel companies have increasingly donated to political parties as the pressure for climate action mounts. For example, an Australian Conservation Foundation report (ACF, 2020), in 2020 revealed that fossil fuel interests had doubled their donations to the major political parties in the country over the previous four years, with the coal, oil, and gas industry contributing AUD $1.9 million in 2018-19. Additionally, in Brussels, the Corporate Europe Observatory and others (Tansey, 2019), have exposed the extent of corporate influence in climate policymaking. Since 2010, fossil fuel corporations and industry organizations have spent at least EUR €250 million in efforts to seek to wield influence within the core of European decision-making (Newell, 2020).

In addition to increased political donations and lobbying activities, incumbents also adjust their discursive strategies as they perceive the threats posed by challengers. As observed by Lee and Hess (2019) in the context of distributed solar energy in the US electricity sector, the volume of framing activity and the divergence of issue frames between incumbents and challengers increase as contestation intensifies.

Another key component of hegemony is accommodation, which includes the notions of passive revolution and trasformismo, as Levy and Egan (2003) explain, “hegemony rests on broad base of consent, which relies on coalitions and compromises that provide a measure of political and material accommodation with other social groups, and ideologies that convey a mutuality of interests”, thus accommodation refers to a strategy employed by dominant groups or classes to maintain their hegemony by co-opting or incorporating elements of subordinate groups or alternative ideologies. It involves the selective incorporation of certain demands or interests of subordinate groups into the existing social order, while simultaneously diluting or neutralizing their potential to challenge the dominant power structures.

Accommodation can take various forms, such as granting limited reforms or concessions, allowing certain cultural or identity expressions, or creating spaces for participation within existing institutions. The goal of accommodation is to maintain stability and control by

channeling and containing opposition, while preserving the overall power dynamics and hegemonic structures of society.

From a Neo-Gramscian perspective, accommodation should be understood within the broader context of a ´war of position´ in which different social groups engage in ongoing struggles to establish and maintain power. It is seen as a strategic move by the dominant group to manage and mitigate potential challenges to its authority, while maintaining the overall structure of inequality and domination. An example is provided by Haas (2019), who in a historical study of contemporary energy politics in the European Union, identifies five strategies utilized by transnational fossil fuel and nuclear energy corporations in an attempt to slow down Europe´s energy transition and further preserve dominance in Europe´s electricity regime. The first one was the strategic compression of the environmental discourse in energy policy from sustainable development to energy decarbonization. The second was to discourage national governments from introducing feed-in-tariffs. The third tactic has been used to expand the view that investment in expensive and uncompetitive renewables hampers economic growth. The fourth was to co-opt Europe´s leading renewable energy industry associations, while the final strategy was to protect traditional business models through the restructuring of incumbents whilst positioning for new opportunities in renewables.

What happens through the accommodation is the amplification of incumbent firms over niche industry organizations, as an external image of involvement in sustainable solutions, which in turn, builds both credibility with policymakers and legitimacy in civil society.

The neo-Gramscian lens, provides a broader account of the political forces of accommodation to help explain why governments introduce niche support policies. Policies that become detrimental, when these niches, under the mask of innovation, are merely a subtle strategy employed by the regime actors, or obstructionists to preserve their dominant position in the status quo.

The carbon network

As noted above, the world´s economy and culture are deeply entrenched in the use of fossil fuels, the world´s society is built around the fossil fuel energy infrastructure, i.e. the carbon lock-in, so the challenge of decarbonization lies in the ability to erode the deep lock-ins that perpetuate the incumbent fossil fuel-based energy system.

The concept of carbon lock-in was first introduced by Unruh (2000) when he spoke of the techno-institutional complex, i.e., when technologies and institutions co-evolve in a path-dependent behavior. He further develops the concept and distinguishes five sources of carbon lock-in: technological, organizational, industrial, societal and institutional (2000). Specifically, carbon lock-in refers to the dynamic in which past decisions relating to GHG-emitting technologies, infrastructure, practices, and their supporting networks constrain future paths (Erickson et al., 2015). There is an inertia of technologies, institutions, politicies, business and human behaviour, all of which interact and one cannot properly function without all the others, that limits the rate of such systemic change through a path dependent process i.e. carbon lock-in, as initial conditions, increasing economic returns to scale, social and individual dynamics act to inhibit innovation, breakthrough and competitiveness of low-carbon alternatives.
Pierson (2000) argues that it is impossible to understand the meaning of a particular social variable without understanding the path it pursued. Especially, the sequence of previous events influences outcomes and trajectories in the same direction, mostly because the relative benefits of the current activity compared to other plausible options increase over time. In other words, there is a rise in the exit costs of switching to some previously possible alternative. This explains why increasing returns processes have quite intriguing characteristics, such as unpredictability, because early events have a large effect and are partly random. Second, the further we are in a process, the harder it becomes to shift to another one, and that goes under the name of inflexibility. This is where lock-in begins. Another characteristic is the non-ergodicity, random events early in a sequence cannot be ignored, because they feed back into future decisions. Finally, there is potential path inefficiency, which refers to long-termism, where the outcome that is locked-in might generate lower payoffs than a forgone alternative.

Seto et al., (2016), have identified three different types or mechanisms of lock-in, that are independent mutually reinforcing and create collective inertia: infrastructural, institutional, and behavioral lock-ins. The interconnectedness between these dimensions also refers to the multidirectional causality that results in a significant implication. Lock-ins come to characterize both the systems, and the system´s components, reason why, changing a locked-in systems demands overcoming substantial obstacles in all of the components. Hence, not a single individual factor but a complex socio-technical entanglements does cause and sustain and sustain carbon lock-in. lock-ins are also the outcome of path dependent processes, driven by the mechanism of increasing returns or self-reinforcing positive feedback.

Lock-in refers to a situation where systems, be they technological, social, political, economic or cultural, become entrenched and resistant to change due to self-reinforcing positive feedback or increasing returns mechanisms. Once established, lock-in systems seek to maintain the status quo. It is important to note that lock-in is neutral in terms of its normative value, meaning that it can have either positive or negative consequences (for example, Ürge-Vorsatz et al., 2018 illustrates positive lock-in). However, when entrenched systems impede desired change, lock-in becomes a problem. In particular, carbon lock-in is seen as a negative condition, as it perpetuates high carbon emissions and leads to dangerous outcomes.

Furthermore, lock-in should be understood as a persistent state rather than a permanent condition that creates systemic barriers to the adoption of alternatives (Unruh, 2000). The term 'lock-in' is used metaphorically rather than literally, and whether or not a system is considered 'locked-in' depends on one's normative perspective on the desired timeframe for change. As the urgency of a rapid transition away from fossil fuels becomes a political and moral imperative, the public increasingly feels trapped in a resistant fossil energy regime.

However, there are significant challenges in decommissioning carbon-intensive technologies such as coal-fired power plants. These technologies have significant upfront costs but relatively low operating costs over their long lifetimes (Erickson et al., 2015). The presence of significant sunk costs due to capital investment and long implementation times makes the early retirement of coal-fired power plants financially burdensome and thus a politically difficult decision (Trencher et al., 2020).

Technology: the warden of the obstructionists

Vegragt et al., (2011) combined different social technical criteria to explain technological lock-in. First, CCS exacerbates the already heavy fossil fuel system. Significant investment is required for the construction of capture plants. Moreover, the integration of CCS necessitates the development of a new infrastructure, including CO2 pipelines and potentially ships to connect power plants with storage sites. The construction timeframe for CCS systems is uncertain, but is likely to be long. Once investments are made, these systems are expected to operate for several decades.

Second, CCS does not alter the interdependence of the fossil fuel regime remains largely unchanged. It continues to be closely tied to centralized power grids for distribution, thereby

undermining the viability of decentralized energy sources that are preferred by many renewable energy alternatives.

Third, the current vulnerability of the fossil fuel regime lies in its legitimacy, which is being challenged by the imperative to address climate change. CCS proponents argue that it can resolve this legitimacy crisis. Its endorsement has been supported by a segment of the scientific community and promoted by professional lobbying organizations and certain NGOs. However, it has also faced opposition from other NGOs, such as Greenpeace, as well as civil society in specific locations. CCS remains relatively unknown to the general public and lacks cultural integration.

Moreover, the introduction of CCS does not significantly change the learning effects. Its promise is predicated on the fact that it does not require changes from power consumers. As an add-on to the existing regime, it can be relatively easily absorbed by producers, regulators, and other stakeholders. However, certain capture approaches are inherently integrated with power plants and may disrupt established practices and standards to some extent.

Finally, the legitimising effect of CCS aligns with the interests of the fossil fuel industry, which is promoting it. However, the high costs associated with CCS and the uncertainty of its financing pose complications.

A problem that arises in case the technology is largely deployed hence, CCS abatement works, fossil fuel power generation will still emit CO2 through residual emissions from power plants due to limited capture efficiency and through emissions from upstream operations worsened by the CCS energy penalty (Meadowcroft and Langhelle, 2009).

CCS is widely considered to be a niche technological innovation, because it appears to fulfill the functions of other niche technological innovations. For this reason, the conceptual framework and tools provided by the functions approach of the Technological Innovation System (TIS) framework (Bergek et al.., 2008; Hekkert et al., 2007) are helpful in understanding why CCS performs as a niche technology. Van Alphen et al., (2008), have applied the functions of this approach to CCS, resulting in seven functions: (**1) Creation of legitimacy; (2) Guidance of search; (3) Knowledge development; (4) Knowledge diffusion; (5) Entrepreneurial activity; (6) Market formation; (7) Resource mobilization**, which will be briefly assessed.

For what concerns the **creation of legitimacy**, the main proponents of the CCS as part of the TIS include governments, multilateral organizations such as the IEA, the fossil fuel industry, certain parts of the scientific community, and selected environmental NGOs (Stephens, 2006). However, there are opposing voices within the environmental movement, while the general

public remains largely unaware of CCS. Strong interest in CCS has been observed in the US, Europe, Australia, Canada, and other wealthy countries with significant fossil fuel reserves (Tjernshaugen, 2008; Meadowcroft and Langhelle, 2009). In addition, international institutions such as the IEA have played a role in coordinating global CCS efforts, and the scientific legitimacy created by the IPPCC report since 2005 (Vergragt et al., 2011) that has augmented the legitimacy for CCS as a credible climate mitigation option. The establishment of legitimacy for CCS also relies on substantive arguments, as studied by Hansson and Bryngelsson (2009). These researchers conducted interviews with scientists, industry representatives, and government officials with a professional interest in CCS. According to their findings, the case for this technology rests on three key arguments:

The first argument is solidarity with the developing world and peace: Experts argue that wealthy nations should support the development of CCS in order to assist developing countries. They believe that without CCS, the impacts of global warming could lead to large-scale migration and conflicts. CCS contributes to security of supply, economic growth, and societal resilience. The second one is that it is perceived as a bridge to a sustainable energy system: CCS is seen as a temporary solution that buys time for the further advancement of renewable energy sources. Experts argue that CCS does not hinder the development of other technologies; instead, market competition ensures the emergence of multiple solutions, all of which are necessary. Some experts even suggest that in the long run, CCS could break the dependence on fossil fuels and serve as a bridge to a hydrogen-based economy. As a matter of fact, a decade later, this seems to be the trend, as hydrogen economy is surging in Europe (Euronews, 2022; Guardian, 2020); Hydrogen is also expected to be a key instrument to meet the EU Green Deal 2050 objective, and EU is planning to ramp up its hydrogen production (JRC Technical Report, EC; 2022). And thirdly, how to maintain modern lifestyles and compatibility with current social structures. Experts argue that CCS offers a modern solution that supports our energy-intensive lifestyles. They contend that CCS is the only viable option, as all other alternatives are expected to fall short.

Guidance of search refers to the selection process necessary to facilitate a convergence in technology development, involving policy targets and expectations about technological options, that guide narratives and scenarios.

R&D stimulates technological innovation by providing new options for technology development and represent the third function of technological innovation system namely, **knowledge development**, which is followed by **knowledge diffusion** which indicates the diffusion of new knowledge within R&D communities, among users and in the wider society.

The other function: **entrepreneurial activity** refers to entrepreneurs who commercialize the technology, conduct commercial trials, and identify and exploit business opportunities. Vergragt et al., (2011) researched the companies involved in CCS demonstration projects around the world and found that the vast majority of industry engagement with this technology is carried out through existing companies, such as fossil fuel suppliers and utilities. Subsequently, this function involves the formation of niche markets by providing temporary competitive advantages through favorable tax regimes, consumption quotas or other public policy activities (Van Alphen et al., 2008). In particular, in the EU, the decision to use revenues from the auctioning of allowances from the third phase of its Emissions Trading Scheme (ETS) to fund CCS is one of the most significant public subsidies announced to date (discussed further in the case study chapter).

And lastly, **resource mobilization** is considered as the financial (including funds for R&D) and human resources serving as necessary inputs for any innovative activity, which could be enacted through investments by venture capitalists or governmental support. Overall, it seems that conceiving CCS as a niche technological innovation on the basis of these criteria could lead to a reinforcement of fossil fuel lock-in.

RESEARCH APPROACH

Problem statement, methodological approach, hypothesis, research questions and frames

CCS and CCUS indicate processes that capture carbon dioxide generated by high-emitting activities, and subsequently transport the collected emissions to sites where they undergo industrial operations, or they are stored underground (CCUS U.S. Department of Energy, 2023). CCS is often conflated with CO2 removal or negative emissions, despite the fact that the technology does not actually remove carbon from the atmosphere, rather it prevents some emissions coming from the combustion of carbon-based fuels from reaching the atmosphere, as long as the later release of the captured gases does not occur (CIEL, 2022). Due to the unproven scalability and high costs associated with CCS technologies, they are unable to significantly contribute to the rapid reduction of global emissions required to limit global warming to 1.5°C. Despite the technology's existence for several decades and substantial government subsidies, the widespread implementation of CCS still faces significant challenges related to feasibility, effectiveness, and expense. Currently, CCS facilities only capture a fraction of global carbon emissions, accounting for less than 1 percent. Of the 28 CCS facilities in operation worldwide, their combined capacity can only capture 0.1 percent of fossil fuel emissions, equivalent to 37 megatons of CO2 per year. Of this capacity, a mere 19 percent (7 megatons) is utilized for actual geological sequestration. The majority of captured CO2 is being utilized to enhance oil production, as discussed below. CCS pilot projects have consistently fallen short of their promises, failing to deliver significant emission reductions. The example of the Petra Nova carbon capture facility, installed at a coal-fired power station near Houston, Texas in 2017, highlights the shortcomings of CCS and the misguided approach of deploying it to support fossil fuel extraction and usage. Despite initial expectations, the CCS system at Petra Nova only managed to capture a mere 7 per cent of the power plant's total CO2 emissions. This was well below the company's ambitious target of reducing CO2 emissions by 90 percent. Furthermore, the captured carbon from Petra Nova was primarily utilized for enhanced oil recovery. However, the collapse of oil prices and demand in 2020 made this process economically unviable. As a result, both the CCS operation and the gas plant that powers it have been indefinitely shut down. This leaves the coal-fired plant as emissions-intensive as ever, with no any meaningful progress in reducing its carbon footprint. The Petra Nova case serves as a clear example of the limitations and shortcomings of CCS implementation in achieving substantial emissions reductions.

To better understand how I reached the hypothesis, an introduction to the methodology used is necessary.

The methodology adopted in this thesis is deductive: a priori, I apply the theory to the data in order to test the theory. The data gathered is qualitative. Deductive qualitative research distinguishes itself from other qualitative approaches in that it begins with theoretical propositions derived from a literature review, which are then applied to data collection and analysis (Pearse, 2019). This means that a predetermined framework is applied to the data, which is developed from concepts drawn from the literature and the theory presented. The theory is composed by the phase-out as an overarching approach, the climate obstruction framework, discourses of delay, concepts of carbon lock-in and path dependencies as well as power, regime, hegemonic bloc in a neo-Gramscian lens, and niche technologies functions. After observing an increase in CCS project proposals in the European region and reporting on the failure of this technology, while bearing in mind the aforementioned literature and theories guiding my knowledge, and adopting the view of many scholars, in considering CCS as an innovative niche technology able to mitigate climate change because it performs the functions that make a technology an innovative niche, able to disrupt the status quo.

I formulate the hypothesis that CCS is being strategically used by the orchestrated actions of the obstructionists as a tactic to delay the phase-out of the fossil fuel regime.

H. CCS as a delay tactic employed by the obstructionists.

The recent upsurge in Europe is why I chose this context to test this hypothesis. In particular, it might help to fill the knowledge gap that I recognize about a European structure of obstruction, that originated in the United States and has only been partially investigated in Europe. To gain a general overview of CCS in Europe, I consulted the European Union´s official website, which led me to the recently established CCUS Forum and the visionary paper for CCUS in Europe, written in 2023. The Forum acts as a direct advisor and influencer of the decisions taken in EU; hence, my interest fell back on who is behind this forum, reason why I searched for the members of it, and the authors of the document. Additionally, a deeper research in the EU´s website on the sources of knowledge on CCS, which in turn directly influence the decision-making process, led me to the Zero Emission Platform, which was set up in 2005, so a brief history of its activities is reported, and the identification of its members conducted. In this way, by answering the following questions, I was able to conduct a discourse analysis:

- **Documents/ websites production and location**

Why was the document produced? Where was the document produced and when? Where was it located? was it easy or difficult to access?

- **Authorship and audience**

Who wrote the document? Who was it written for?

- **Documents/ websites text**

What are the key elements? Is there evidence of the discourses presented in the theoretical framework?

With regard to authorship of the documents, an analysis of the writing team of the vision paper from the CCUS Forum writing groups will be conducted, along with a deeper look into the members of the CCUS Forum and the ZEP platform. While the Forum has recently emerged (2021), there will be only a brief excursus of the history of ZEP.
This could deepen the understanding of how the framing of CCS in a certain way in documents, platforms and forums used as sources for the EU decisions on the implementation of the technology, might be slowing down the phase-in of the transition, especially given the authorship behind them.

Therefore, this thesis seeks an answer to the questions:

Q1. Who are the actors pushing for CCS in Europe?

Q2. Do the data report the strategies and discourses presented in the theoretical framework?

Q3. Are these actors obstructing the phase-in of the energy transition, and reinforcing the lock-in of the existing energy system?

The analysis of the data was guided by discourse analysis and, as it will be explained later in this chapter, the analysis combined critical discourse analysis with framing analysis, guided by Entman´s (1993) conceptualization of framing. As the data was analyzed, central themes based on the theoretical background were recurrent and therefore led me to the identification over time of the following three frames:

- **F1. LEGITIMACY**

  What are the scientific sources that support CCS as the solution to mitigate climate change? How are the frames being utilized?

- **F2. TECHNOLOGICAL OPTIMISM**

  Is there evidence of an unquestionable belief that the CCS technology will produce an optimistic outcome?

- **F3. BRIDGE TECHNOLOGY**

  CCS is often considered a bridge technology towards a low-carbon future, is there evidence of this frame?

F1. Legitimacy refers to the reliance on international institutions such as IPPC, IEA, as well as compliance i.e. adherence to regulations, to provide scientific support for their claims. Compliance refers to claims of adherence to established regulations and standards, by highlighting potential achievements in fulfilling emission policies, safety requirements and criteria for habitat restorations, compliance reflects an environmentally acceptable behavior.

F2. Technological optimism indicates the belief that CCS technology represent THE technology able to mitigate climate change.

F3. Bridge technology refers to the conceptualization of CCS as the bridge technology to a decarbonized future energy system. When identifying this frame, I was able to also identify an omission, which refers to that fact that a certain relevant topic is not mentioned or briefly touched on. In this case, I refer to omissions of the alternative options able to mitigate climate change, such as renewable sources, and also the omission of the consideration of changing several aspects of everyday life, as CCS ensures a continuation of the current lifestyle, where an alternative is not even considered. As Megura and Gunderson (2022) state when referring to fossil fuel companies´ actions of greenwashing through omission, that they omit the possibility of an alternative organizations of society, that does not rely on fossil fuels.

The importance of omissions is highlighted by Entman´s (1993) frame analysis (presented below).

Furthermore, I recognize a knowledge gap on climate obstruction as presented above, i.e., a specific identification of the structure of obstruction SSCN (2021), in the European context, therefore this thesis, through the identification of some interlinkages between fossil fuel companies, think tanks and institutions, could be helpful in the progressive construction of the scheme, which, as presented, is extremely entrenched and cannot be researched within the scope of this thesis, hence, when referring to obstructionist actors, in the following chapters, the term will refer only to a part of them, who, however, can be considered as the drivers of the whole obstructionist movement, i.e. the fossil fuel companies.

For these and the following reasons, I found critical discourse analysis, combined with frame analysis, useful for the deployment of this project.

Within critical social analysis there is a long-standing tradition of viewing social realities as "conceptually mediated" or as Fairclough (2013) states "meaning that there are no social events or practices without representations, constructions, conceptualizations or theories of them" (pp.178). In other terms, social realities have a reflexive character and how different people see, represent, interpret and conceptualize them is embedded in those realities. When the focus of the critical social analysis is placed on the discourse, critical discourse analysis takes shape. Critical Discourse Analysis (CDA) is grounded in a critical theory of language, that views language use as a social practice. It recognizes that all social practices are situated within specific historical contexts and serve to reproduce or challenge existing social relations while promoting different interests. CDA examines the intersections of discourse and power, asking questions about positioning, whose interests are served or negated, and the consequences of such positioning. Fairclough's model for CDA, involves three interconnected processes of analysis, tied to three dimensions of discourse. These dimensions encompass the object of analysis (verbal, visual, or both), the processes by which the object is produced and received by individuals (writing, speaking, designing, reading, listening, viewing), and the socio-historical conditions that govern these processes. In essence, texts are seen as manifestations of socially regulated discourses, and the processes of production and reception are socially constrained. CDA contributes a more satisfactory account of how discourses may affect social change and the production and contestation of hegemonies. Reason why is being adopted in this research. According to Van Dijk (2006), the main focus of critical discourse analysis is to understand significant social issues. Wodak and Mayer (2009) argue that critical discourse analysis highlights the importance of interdisciplinary work in order to comprehensively grasp how language functions in shaping and transmitting knowledge within social institutions.

Rogers et al (2005) state that critical theories primarily address power dynamics and justice, examining how different social systems are constructed, reproduced, or transformed based on factors such as economics, race, class, gender, religion, education, and sexual orientation. Human subjects employ texts to interpret their world and to construct social actions and relationships in their daily lives. Simultaneously, texts position and shape individuals, offering different meanings, ideas, and perspectives on the world (Lucke 1996). The scope of critical discourse analysis encompasses the analysis of texts, interactions, and social practices at the local, institutional, and societal levels. It delves into the long-term analysis of the underlying causes and consequences of issues, and requires a comprehensive understanding of the intricate relationships between text, discourse, society, and culture. By examining the social issues within a community and the language and types of texts used, we can gain a better understanding of teaching and learning strategies.

McGregor (2010) argues that CDA challenges us to move away from viewing language as abstract and instead recognize that our words carry meaning within specific historical, social, and political contexts. Therefore, critical discourse analysis examines real-life instances of social interaction, which often take linguistic forms (Blommaert & Bulcaen 2000). Locke (2004) states that the objective of CDA is to systematically explore the intricate and often hidden relationships between discursive practices, events, and texts, and the broader social and cultural structures, relations, and processes. It investigates how these practices, events, and texts emerge from and are ideologically shaped by power relations and power struggles.

CDA is closely related to frame analysis, the second method adopted in this research. The concept of ´frame´ highlights how experiences are influenced by the selection and emphasis of information (Entman, 1993). Frames are pervasive in society and play a role in shaping perceptions, even when there is no awareness of their presence (Goffman, 1974). Both individuals and organizations can intentionally adopt framing strategies to highlight certain aspects of reality. By making selected information more salient, it becomes more noticeable, meaningful, or memorable. Frames can be powerful tools for organizations to shape their public image, define problems, assign causes, make moral judgments and propose solutions (Entman, 1993). Since salience is shaped by the interplay between texts and recipients, the mere identification of frames in a text by researchers does not automatically imply their impact on audience perceptions (Entman, 1989; Graber, 1988). A notable illustration of the influential role of framing and its mechanism of selectively emphasizing certain aspects of reality while disregarding others is provided by Kahneman and Tversky (1984), which has been extensively

referenced in scholarly discussions. Frames derive their influence not only from what they include, but also from what they omit, since the exclusions of possible problem definitions, explanations, evaluations, and recommendations can be just as significant as the inclusion in shaping audience perceptions. Frames exert their power by selectively depicting and omitting specific aspects of a situation (Entman, 1993). Frames have the ability to shape the way information is perceived, influencing the audience's understanding and potentially ignoring alternative facts or perspectives. They also provide insights into the values and priorities of those who employ them. In the context of climate change, the fossil fuel industry, as a powerful actor, has used frames to mainstream specific narratives (Arranz, 2015). An analysis of previous studies on industry communication between 1990 and 2010 revealed three overarching and evolving frames: scientific uncertainty, socioeconomic consequences of emissions reductions, and industrial leadership in climate protection. The industrial leadership frame (Schlichting, 2013), which remains prevalent today, involves industrial actors taking responsibility for climate change while emphasizing technological innovation as the primary means to address it. European oil and gas companies played a significant role in pioneering this frame. In contrast, US corporations initially resisted carbon emission regulations more aggressively. They formed industry associations, lobbied politicians, cast doubt on climate science, and emphasized the high economic costs of emissions reductions, as seen in the structure of obstruction. European industry, on the other hand, demonstrated a willingness to invest in emission-reducing technologies (Levy, 2005). By examining these framing strategies employed by different actors, a better understanding on how they shape public perceptions, influence policy debates, and reflect the values and interests of the fossil fuel industry, can be gained. Critical analysis of these frames helps to uncover the underlying power dynamics and ideologies at play in the discourse surrounding climate change. The aim of the analysis of these documents, platform and members, is to look at both what lies behind them and within them, and to uncover the underlying dynamics and actors in the discourse surrounding CCS. The advantage of using these methods is that the documents and websites are available free of charge. A further advantage is the unobtrusive nature of these methods, which makes the analysis non-reactive, i.e., the people being studied are unaware, but they leave evidence of their actions, so the observant researcher can infer from the evidence without disrupting those being studied, and the data sources can be read and reviewed multiple times and remain unaltered by the researcher´s influence or the research process (Bowen, 2009). Documents can provide background information and broad coverage of data, even data that can no longer be observed, provide details that informants have forgotten and can track change and

development. The combination of these analyses can also point to questions that need to be asked or to situations that need to be observed, ensuring a critical and comprehensive research (Bowen, 2009). At the same time, concerns arise from choosing this type of analysis; the first disadvantage is that a document or a platform may not perfectly provide all of the necessary information required to answer the research questions, some documents may only provide a limited amount of useful data. Sparseness of documents may also occur, leading to more searching, and sometimes they may not be available or easily accessible (Bowen, 2009). Moreover, another concern that I recognize is the potential presence of biases, such as confirmation bias, deriving from the background that might alter the understanding of the data, that I try to limit in order to preserve the credibility of the research. Additionally, I recognize that the number of websites, and documents consulted might not be sufficient to infer a generalization. Especially, the amount of sources consulted, is not sufficient, to convincingly state that the same structure of obstruction exists in Europe, however, it might help other projects in this direction.

DATA AND RESULTS

Status of CCS in Europe

An overview of the European´s status on CCS, is helpful to understand what measures have been taken in this area to encourage CCS deployment, and a short explanation of the technology per se. The data here presented has been retrieved from the EU´s official website.

On 15th December 2021, the Commission released a communication titled "Sustainable Carbon Cycles," outlining its long-term objective of restoring sustainable and climate-resilient carbon cycles. The Commission's strategic vision for the long term relies in part on CO2 removal techniques based on CCS, either combined with direct air capture (DACCS) or biomass (BECCS), to achieve climate neutrality. The goal of climate neutrality is enshrined in the European Climate Law (Regulation (EU) 2021/1119), which mandates that greenhouse gas emissions (GHG) and removals across the Union must be balanced by 2050, with subsequent efforts focused on achieving negative emissions. Furthermore, esteemed organizations and institutions such as the Intergovernmental Panel on Climate Change (IPCC), the International Energy Agency (IEA), and the National Energy Technology Laboratory (NETL) emphasize that without carbon removals, it becomes challenging to meet the temperature targets outlined in the Paris Agreement.

CCS involves a series of key steps: capturing CO2 at its source, compressing it for transportation, and injecting it deep into carefully chosen and secure underground rock formations for permanent storage.
Capture: CO2 is separated from other gases generated at industrial facilities such as coal and natural gas power plants, steel mills, cement plants, and refineries.
Transport: After separation, the CO2 is compressed and transported to a suitable storage site using pipelines, trucks, ships, or other transportation methods.
Storage: The CO2 is injected into deep underground rock formations, typically at depths exceeding one kilometer, where it remains permanently stored.

The EU has taken significant steps towards the development and deployment of CCS as part of its efforts to tackle climate change and achieve the goals of the European Green Deal. Some key actions and initiatives include:

- EU strategy on CCS: The EU has outlined a strategy on CCS as part of its efforts to achieve climate neutrality by 2050. The strategy emphasizes the need to scale up CCS deployment and establish a viable market for carbon capture technologies.

- Funding and support: The EU Innovation Fund plays a crucial role in supporting CCS projects by providing financial assistance. It aims to invest a substantial amount of funding in innovative technologies such as CCS, by 2030.

- Carbon market and ETS: The EU Emissions Trading System (EU ETS), a key policy instrument of the European Green Deal, creates economic incentives for CCS. By putting a price on carbon emissions, the EU ETS encourages industries to invest in low-carbon technologies, including CCS, to reduce their emissions and comply with emission reduction targets.

- Just Transition Mechanism: The EU's Just Transition Mechanism, established to support regions and sectors most affected by the transition to a climate-neutral economy, includes funding opportunities for CCS projects. This mechanism provides financial support to facilitate the decarbonization of industrial regions, helping them transition to a sustainable future.

- Innovation and Research: The EU invests in research and innovation projects related to CCS through programs like Horizon Europe and the European Research Council. These initiatives support the development of new CCS technologies, improve efficiency, and contribute to the advancement of knowledge in the field.

- Regulatory Framework: The EU is working on updating its regulatory framework to provide a clear and supportive environment for CCS deployment. This includes reviewing and revising regulations on storage permits, liability, and infrastructure development to facilitate the establishment of a well-functioning CCS market.

Furthermore, the recent Net-Zero Industry Act forms a crucial part of the Green Deal Industrial Plan's efforts to create a regulatory environment that is both predictable and simplified. Its primary objective is to encourage investments in the production capacity of essential products that play a significant role in helping the EU achieve its climate neutrality goals. The Green Deal Industrial Plan is a recent effort employed by the European Commission, to further support climate neutrality targets, with a focus on the industrial sector. By strengthening the EU's net-zero technology industrial base, the Act enhances competitiveness and resilience, establishing a robust foundation for an affordable, reliable, and sustainable clean energy system. The Act also aims to accelerate the development and production of net-zero technologies (EC, 2023).

This Regulation encompasses a wide range of products, components, and equipment necessary for manufacturing net-zero technologies. It distinguishes between net-zero technologies and strategic net-zero technologies. The latter category makes a significant contribution to decarbonization by 2030 and is either commercially available or expected to enter the market soon. While all net-zero technologies benefit from the provisions outlined in this regulation, strategic net-zero technologies enjoy additional advantages. They can participate in auctions under the resilience criterion and have the opportunity to become Net-Zero strategic projects, which grants them priority status and shorter timelines. The selection of these projects is based on three key criteria: technology readiness level, contribution to decarbonization and competitiveness, and resilience of the energy system (EC, 2023).

The list of technologies covered by this Act includes solar photovoltaic and solar thermal technologies, onshore and offshore renewable technologies, battery/storage technologies, heat

pumps and geothermal energy technologies, electrolyzers, and fuel cells, sustainable biogas/biomethane technologies, CCS technologies, and grid technologies.
To provide clarity and long-term signals to manufacturers and investors, the proposal sets a benchmark requiring the manufacturing capacity for strategic net-zero technologies to fulfill at least 40% of the EU's annual deployment needs by 2030. This benchmark ensures predictability and enables tracking of progress. Additionally, the Act establishes a target of achieving 50 million tonnes of annual CO2 storage capacity by 2030 to facilitate carbon capture and storage projects and increase the availability of CO2 storage sites (EC, 2023).

Supportive climate policy programmes and measures from the European Commission have been notable factors in driving the momentum for CCS. One significant initiative is the EU Innovation Fund, a grant programme launched in 2020 to support the Commission's 2050 climate neutrality targets. Through this fund, the European Commission has increased the number of projects funded, provided financial support for CCS projects and encouraged their implementation. These supportive policies and measures create a conducive environment for CCS deployment, fostering the growth and advancement of CCS technology in the European Union (GCCSI, 2023). Indeed, the Netherlands and the UK have also demonstrated a promising trajectory in the deployment of CCS projects based on existing policies and funding initiatives. In the Netherlands, the Sustainable Energy Transition Subsidy Scheme (SDE++) has played a significant role. This scheme, which supports various sustainable energy projects, including CCS, has witnessed a substantial increase in funding. Last year alone, the allocated funds for the SDE++ scheme rose from €5 billion to €13 billion. This expanded financial support has created opportunities for CCS projects to secure funding and advance their implementation in the Netherlands.
Similarly, the UK government has demonstrated its commitment to CCS through its CCUS Infrastructure Fund (CIF). The CIF aims to establish two CCS clusters by the mid-2020s and an additional two clusters by 2030. By providing funding and support for CCS infrastructure, the UK government has paved the way for the development of CCS projects and clusters in the country.
These examples highlight how dedicated funding schemes and policy commitments can drive the deployment of CCS projects. The increased financial support and clear targets set by these initiatives have encouraged industry participation and accelerated the progress of CCS technology in both the Netherlands and the UK (GCCSI, 2023).

The EU Innovation Fund serves as a crucial financial support, for the development and deployment of various technologies, that will accelerate the transition to a more sustainable and climate-neutral Europe; in which CCS has gained prominence. The EU Innovation Fund is also coupled with the EU Emissions Trading Scheme (EU ETS), as well as policy initiatives from individual member states (GCCSI, 2023).

A Vision for CCUS in EU

The analysis of the CCUS strategy in the EU, is helpful to understand the current actions that the EU intends to take towards a decarbonized future with the help of this technology.
This Vision paper has been written by the Working Group co-chairs (Tab 1.) in collaboration with the Working Group members (Tab 2.) and formal submissions of input from nearly all participants. The paper originates from the CCUS Forum, a robust stakeholder consultation platform established by the European Commission in 2021, with the goal to bring together representatives of the EU institutions, EU and third countries, NGOs, business leaders and academia to facilitate the deployment of the technology.

Tab 1. Working group co-chairs

WORKING GROUP CO-CHAIRS
Clean Air Task Force
Danish Ministry of Climate, Energy, and Utilities
Florence School of Regulation

Tab 2. Working group members

WORKING GROUP MEMBERS
Agora Energiewende
Air Liquide
Aker Carbon Capture
ArcelorMittal

Austrian Association for Building Materials and Ceramic Industries
Avenia Pycasso
Baker Hughes
Bellona Europa
Bioenergy Europe
BP
Bundesministerium für Wirtschaft und Klimaschutz
Carbo Culture
Carbon Clean
Carbon Engineering Ltd.
CCSA/Zero Emissions Platform
CEFIC
Chevron
Cimpor
Climeworks
CO2 Value Europe
CO2 Value Australia
CO2 Geo Net
Communauté d'agglomération Pau Béarn Pyrénées
DC & P
DGMK
DOW
DRAX GROUP
EBN
EERA
eFuel Alliance
Energy Policy Group
Engie Laborelec
ENI

Equinor
ERCST
EUROFER
Eurogas
ETH Zürich
European Lime Industry Association
Evida
Fortum Recycling & Waste
Gassnova
GE
Global CCS Institute
Göteborg Energi and Renova
Government of Flanders
Hafslund Oslo Celsio
Heidelberg Materials
Holcim
TES Hydrogen
INERCO
IOGP
KlimaDiskurs.NRW
LanzaTech
Margriet Kuijper Consultancy
MCi Carbon
Ministry of Economy and Sustainable Development, Croatia
Mitsubishi Heavy Industries
Negative Emissions Platform
Norddanmark EU Konter
Norsk Hydro
Northern Lights
Norwegian Ministry of Foreign Affairs
Norwegian Ministry of Petroleum and Energy

Norwegian Petroleum directorate
Offshore Energies UK
Port Rotterdam (Porthos)
RasmussenGlobal
Repsol
RWE Generation SE
SCHWENK Latvija
Shell
SIA partners
SNAM
South Pole
Stiftung Wissenschaft und Politik (SWP)
Stockholm Exergi
Swedish Environmental Protection Agency
The Bioenergy Association of Finland
The European Lime Association
Total Energies
UNIPER
University of Zagreb
Verein Deutscher Zementwerke e.V.
VW
Wintershall DEA

The document´s introduction refers to the IPCC´s findings on the necessity to rapidly transit to net zero greenhouse gas emissions in order to limit global warming to 1.5 degrees Celsius above pre-industrial levels, in accordance with the Paris Climate Agreement. In response to the climate crisis, the European Union has set a legally binding target to achieve ´net-zero´ greenhouse gas emissions by 2050, as well as an interim target of a 55% reduction by 2030 (COM EU, 2019). In this document, CCUS represents the main technology capable of realiinge both global and EU net-zero ambitions.

In order to scientifically support the urgent need for CCUS technology, the document refers to international institutions´ documents such as: the IEA ´s "Net zero by 2050" scenario (IEA, 2021), which indicates a 7.6 Gt of co2 captured per year globally by 2050, of which circa 350

Mt/year is in Europe. It also refers to DNV´s "Pathway to Net Zero" which has foreseen a 570 Mt of CCS in Europe by 2050. The IPCC´s 6th Assessment Report with its Integrated Assessment Model, which calculated a median of 665 Gt of CO2 to be captured and stored globally by 2100 under 1.5 degrees Celsius compatible scenarios, is also used as a reference point in the document. From the IPCC Report it is also claimed that of seven ´Illustrative Mitigation Pathways´, there is only one pathway without CCS deployment, which would require almost 50% drop in global primary energy consumption by 2045 (IPCC, 2022).

(Emergence of F1. Legitimacy)

Through the analysis of the document 51 times there is the recurrency of the term "need/needed" when referring to CCS technology to be deployed. Furthermore, in the second page is remarked in bold the following phrase "*Without large-scale carbon capture, utilization and storage (CCUS), the EU will significantly fail to meet its Green Deal objective of being climate neutral by 2050*" (EU CCUS Forum, 2023; pp2).

(Emergence of F2. Technological optimism)

The reasons listed by the Working Group are the following:

- Permanent removal of CO2 from the atmosphere will become essential according to climate modelling by the European Commission and the IPCC, thus Europe will need to capture and store at least 150 Mt/year of CO2 from atmospheric or biogenic sources by 2050.
- Hard-to-abate process industries such as cement, lime, some chemicals and waste incineration, can mitigate emissions almost exclusively through the vital means offered by CCUS. The technology is argued to be a key part of the lowest-cost decarbonization pathway for many emitters, with the potential to deliver greenhouse gas cuts at scale.
- For what regards the power sector, the application of CCUS to fossil or biomass-fired power plants could enable faster and more complete decarbonization of the grid, to support the intermittency of wind and solar generation and thus serve as long-term energy storage, particularly in regions with significant existing and recently built fossil power capacity.

> *"For all these reasons and based on the compelling evidence from energy system modelling, this working group reaches the conclusion. ´no CCUS, no net zero´. The scale of the challenge is significant. Based on major energy system modelling studies by the European Commission, the IEA, and other, the EU will need to capture and utilize or store between 300 and 640 Mt of CO2 per year by 2050 to meet its climate goals, with most estimates towards the upper range. Several studies of 1.5 degrees Celsius compatible scenarios indicate that up to half of the CO2 stored in 2050 will be for the purpose of carbon dioxide remova*l" (EU CCUS Forum, 2023; pp. 3).

(Emergence of F1; F2.)

Nonetheless, the document reports on the very limited action taken by the EU to deploy the urgent need for CCUS and to build out a CO2 transport network and storage capacity.
A deeper look at the document, reports how energy-intensive industries will progressively be fully exposed to the Emissions Trading System (ETS) (the currently proposed reform), in combination with the Carbon Border Adjustment Mechanism (CBAM), through the elimination of free allowances. The working group explains how, in the absence of ready access to cost-effective CO2 transport and storage, multiple companies will cease their effort to decarbonize given no reasonable options, with a consequent action of only purchasing ETS allowances, which will further result in increased costs, no climate benefits, and a weakening of the financial capabilities of companies to decarbonize. For such companies it is argued that the absence of a cost-effective infrastructure in the current decade will threaten their competitiveness and capabilities to decarbonize. Furthermore, the working group highlights how the ETS represents the main underlying mechanism for determining whether and how much CCUS will be needed, and goes on to explain three main reasons behind a positive approach of the Commission and Member States to develop CCUS in the coming years. The first, is the fact that CO2 infrastructure and storage will need to be shared assets, as it would not be cost-effective for companies to do this on their own. Therefore, infrastructure companies will need to serve multiple customers to ensure economies of scale. The second reason states the uncertainty of modelling estimations, hence the need to develop pipelines and storage, before the demand develops. And thirdly, the required investments surpass multiple billions of euros, arguing that without a strong commitment from the Commission to support and invest in CCUS, climate ambitions will not be met. The vision document also foresees the

development of the Ten-Year Network Development Plan for CO2 infrastructure and establishment of a CCUS ENTSO (European network of Transmission System Operators for Electricity) by 2024, along with a long-term market-based regulatory drivers for CCUS both as a tool for industrial decarbonization and CO2 removal, as well as the proliferation of forums and platforms to increase knowledge sharing and collaboration between Member States, relevant authorities, and industry, including CCUS Forum working group and an EU CCUS Alliance, reflecting the recommendations of the WG Industrial Partnership, as the working group highlights the importance of a wider societal understanding of CCUS, enabling the interaction of different actors.

(F1. And F2)

The European Commission also supports the CCUS Project Network (2018-2023), which acts as a facilitator for knowledge sharing between major industrial projects underway across Europe. Since 2022, the network is part of CCUS ZEN (Zen Emission Network), a platform of the Commission to explore the potential for accelerating deployment of CCUS in two regions with lower maturity levels for CCUS compared to the current development in the North Sea region. This transferring of knowledge is imagined to enhance CCUS value chain across Europe.

Furthermore, the document notes the presence of nationally supported CO2 transport and storage projects that have been able to catalyze the recent growth in plans for CCS facilities. The selection of multiple CO2 capture and storage projects through the initial calls of the Innovation Fund has been facilitated by the availability of state-funded storage sites in the North Sea, which are now facing a significant surplus of applications. However, in the Netherlands, the progress of new CCUS projects under the SDE++ scheme encountered obstacles in 2021 due to insufficient storage capacity to meet the project bidding schedule. In the early stages, it is crucial for the EU to take proactive measures to develop storage capacity in anticipation of future demand. The recent integration of CO2 storage into the TEN-E regulation and the allocation of funding for two new storage sites in Iceland and Bulgaria through the Innovation Fund are significant steps forward. The document continues stating that despite of this, to provide guidance to the market and ensure the proactive and coordinated development of storage capacity, the EU, Member States, relevant authorities, and potential private-sector storage site developers should consider the following:

- *«A plan to identify and facilitate the development of strategically placed storage sites, based on Member State submissions of prospective capture and storage volumes.*
- *Providing funding for relevant expert bodies (e.g., geological surveys) to establish an open-access CO2 storage resource 'atlas' for the whole region, based on consistent methodology and maximising access to data from oil and gas operators»* (EU CCUS Forum, 2023; pp.22).

Appealing to the knowledge, technology and skills of the oil and gas industry, without which, the decarbonization would not happen.

Zero Emissions Platform (ZEP)

ZEP is the advisor to the EU on the deployment of CCS and CCU part of a broader European technology and innovation Platform (ETIP) under the European Commission's Strategic Energy Technologies Plan (SET-Plan), supported by the European Union and receiving funding from Horizon Europe.

«ZEP supports the European Union's commitment to reach climate neutrality by 2050, defined as net- zero greenhouse gas (GHG) emissions by 2050. To this end, CCS technologies represent readily available and cost-efficient pathways for decarbonising industrial and energy sectors in the European Union» (ZEP, 2023).

(F1. Especially compliance; and F2)

From the platform´s website there is also the speech from President von der Leyen (2023) on the occasion of the launch of CO2 storage in the first full value chain CCS project in EU, via video message, some extracts follow:

"We are now also using the depleted oil and gas fields in the North Sea to send carbon back down into the ground. It shows, once again, that the North Sea is increasingly playing a crucial role in Europe's net-zero future. (...) This project is therefore a significant step towards European carbon neutrality. The science is clear: industrial carbon removal is a necessary part of our climate toolbox. The International Energy Agency and the UN's Intergovernmental Panel on Climate Change are on the same page. To to keep global temperatures below 1.5

degrees we need to remove carbon on top of our efforts to reduce emissions. Because for the EU to become climate neutral, we need to industrially store around 300 mega tons of CO2 annually by 2050. This is a staggering amount. But you are showing how it can be done. With European cooperation. As this project demonstrates the tremendous know-how we have in Europe. It is one of the key assets that will help us build the infrastructure and the economy of tomorrow»

(F1.)

The members of Zero Emissions Platform are in total 27, of which 7 are oil and gas/ energy companies (including Northern Lights JV DA, as it is owned by Equinor, Shell and Total Energies).
From the official website ZEP *reports "ZEP´s broad membership base- from oil&gas, industry, utilities and equipment suppliers, to research, trade unions, and environmental NGOs- results in balanced vies and recommendations, making ZEP a trusted organization to liaise with the European Institutions and cooperate with Member State governments."*

Tab 3. ZEP memebers

AICIA/ University of Sevilla
BP
BRGM/ Geosciences pour une Terre durable
Clean Air Task Force
E3G
EBN
ENI S.p.A.
Equinor
ETUC
ExxonMobil
EG Energy Europe
GeoEcoMar
Hafslund Oslo Celsio
Heidelberg Materials

Hydro
IFP Energies Nouvelles
Mitsubishi Heavy Industries
National Technical University of Athens (NTUA)
Northern Lights JV DA
Port of Rotterdam
Shell
SINTEF
Sustainable Decisions
The Bellona Foundation
TNO Energy
TotalEnergies
University of Edinburgh (SCCS)

From the historical excursus of ZEP, the platform was established in 2005 as an advisory body to the European Commission on public research policies, under the name of European Technology Platform for Zero Emission Fossil Fuel Power Plants. Receiving half of its funding from the European Commission's research budget, its primary goal was to help the European union in the identification of research priorities and canalize research funding in industrial relevance areas.

Since its inception, the ZEP has been dominated by corporation with high degrees of interests tin fossil fuels and CCS technology in particular. It was composed of 23 companies, 7 research institutes and 3 NGOs, with the highest involvement of Vattenfall, Alstom, BP, Shell, RWE, EoN, Enel, Endesa and Statoil (CEO, 2009).

Back in 2009, ZEP´s desire from COP15, was that the Ministers present at the event, could recognize CCS "as a key tool for reducing emissions under international offset mechanisms, such as clean development mechanisms" (CEO, 2009).

Since 2008, for instance, the EU has sustained the idea that *"the carbon market, including the clean development mechanisms*" should be used to support CCS projects under a global agreement (EU Council, 2008). ZEP´s strategy at the beginning, was to *"team up with other platforms such as hydrogen, cement, steel and biofuels" (*ZEP, 2009; pp 5), to strengthen their case for additional finance.

At COP15 in Copenhagen, ZEP was joined by the Carbon Capture and Storage Association (CCSA), with which it shares 12 core companies such as BP, Doosan, EoN, EDF, General Electric, RWE, Schlumberger, Shell, Statoil, Total and Siemens (UNFCC, 2009).

Working group co-chairs and members of the CCUS Forum

Given the strong role played by the CCUS Forum in providing advice and thus influencing the European Commission, a more in depth research was carried out to the members who collaborated in the drafting of the document, was undertaken and a brief explanation is provided in the following tabs (4;5).

Tab 4. Working group co-chairs

WORKING GROUP CO-CHAIRS
Clean Air Task Force: catalyzes the global development of climate-change technologies.
Danish Ministry of Climate, Energy, and Utilities
Florence School of Regulation: centre of excellence for independent discussion and knowledge exchange about EUpolicies in energy, climate, transport, water and waste.

Tab 5. Working group members

WORKING GROUP MEMBERS
Agora Energiewende: non-profit think tank that develops strategies to advance the goal of climate neutrality in Germany.
Air Liquide: gas and technology services company for industry and health.
Aker Carbon Capture: carbon capture provider, from oil and gas company Aker Solutions.
ArcelorMittal: steel manifacturer
Austrian Association for Building Materials and Ceramic Industries
Avenia Pycasso: cluster of geosciences for CCUS in the Pyrenian Piemont area.
Baker Hughes: energy technology company
Bellona Europa: independent non-profit organization to fight climate challenges.
Bioenergy Europe: non-profit, Brussels-based, international organization about bioenergy.
BP: multinational oil and gas company.
Bundesministerium für Wirtschaft und Klimaschutz: is the Federal Ministry for Economic Affairs and Climate Action.
Carbo Culture: climate technology company building biochar carbon removal.

Carbon Clean: CO2 recovery technology company.
Carbon Engineering Ltd: Canadian-based clean energy company, specializing on DAC.
CCSA/Zero Emissions Platform: EU platform for CCS.
CEFIC: European Chemical Industry Council.
Chevron: oil company
Cimpor: cement group from Portugal.
Climeworks: Swiss company specializing in DAC.
CO2 Value Europe: international, non-profit association dedicated to CCUS.
CO2 Value Australia: industry policy group, representing CO2 utilization stakeholders in Australia.
CO2 Geo Net: European Network of Excellence on the geological storage of CO2.
Communauté d'agglomération Pau Béarn Pyrénées: french intermunicipal structure of the Pyrénées area.
DC & P:
DGMK: German joint research to advance petroleum science and technology transfer to industry.
DOW: material science company.
DRAX GROUP: power generation business.
EBN: European Business and Innovation Centre Network.
EERA: European Energy Research Alliance.
eFuel Alliance. Interest group committed to promote the political and social acceptance of efUELS.
Energy Policy Group: Bucharest-based non-profit, independent think tank, specializing in energy and climate policy.
Engie Laborelec: research centre in electrical pwer technology.
ENI: Italian multinational oil and gas company.
Equinor: Norwegian state-owned multinational oil and gas company.
ERCST: independent, non-profit organization of the EU, on climate change and sustainable transition.
EUROFER: European Steel Association
Eurogas: association of 70 companies and associations who cover retail and wholesale gas markets.
ETH Zürich: Public Swiss University.

European Lime Industry Association: sector-based representation for the European lime industry.
Evida: Danish manufacturing company specialized in gas distribution.
Fortum Recycling & Waste: waste management company.
Gassnova: Norwegian state enterprise for CCS
GE: energy equipment, solutions and services provider.
Global CCS Institute: international think tank of ccs
Göteborg Energi and Renova: swedish, municipal energy company.
Government of Flanders
Hafslund Oslo Celsio: Norwegian renewable thermal energy
Heidelberg Materials: building materials company.
Holcim: sustainable building solutions company.
TES Hydrogen: global green hydrogen company.
INERCO: energy technologies company.
IOGP: international association of oil and gas producers.
KlimaDiskurs.NRW: politically independent association about climate change.
LanzaTech: carbon recycling technology company.
Margriet Kuijper Consultancy: indipendent consultant on CCS.
MCi Carbon: Australian led technology for CCUS.
Ministry of Economy and Sustainable Development, Croatia
Mitsubishi Heavy Industries: Japanese multinational, electrical equipment and electronics corporation.
Negative Emissions Platform: Brussels-based partnership to improve the political and public recognition of carbon removal technologies and solutions.
Norddanmark EU Konter: association of northern Denmark Region.
Norsk Hydro: operator of power production in Norway.
Northern Lights: CCS project operated by Equinor, Shell and TotalEnergies.
Norwegian Ministry of Foreign Affairs
Norwegian Ministry of Petroleum and Energy
Norwegian Petroleum directorate
Offshore Energies UK: integrated offshore energy industry for cleaner fuel, power and products in UK.

Port Rotterdam (Porthos): dutch CCS project.
RasmussenGlobal: international political consultancy firm.
Repsol: Spanish multinational energy and petrochemical company.
RWE Generation SE: power generation company based on gas, hard coal, hydropower and biomass.
SCHWENK Latvija. Building materials company.
Shell: investor-owned oil and gas company.
SIA partners: consulting firm.
SNAM: Gas Italian gas company.
South Pole
Stiftung Wissenschaft und Politik (SWP)
Stockholm Exergi: Stockholm´s energy provider.
Swedish Environmental Protection Agency
The Bioenergy Association of Finland
The European Lime Association
Total Energies: French multinational energy and petroleum company.
UNIPER: German energy company.
University of Zagreb
Verein Deutscher Zementwerke e.V: german association of cement manufacturing companies.
VW: German automobile manufacturer.
Wintershall DEA: german oil and gas producer.

A dominance of companies with interests in fossil fuels is present, as well as energy ministers from countries with high reliance on fossil fuels, equipment and materials industries, steel and lime companies and CCS projects owned by oil and gas companies, including associations such as IOGP, CEFIC and companies such as Shell, have a long, documented history of lobbying in the European Union and share a network of members among them.

At the outset of the CCUS Forum´s vision paper, there is a reliance on scientific institutions such as the IPCC, IEA and DNV, which are strategically put in the document to provide scientific support for the ´need´ for CCS technology. In fact, through the analysis of the

document the term is used 51 times; I argue to be strategically used, as it refers to the CCS technology as the main mitigation action to address climate change, despite the fact that only a handful of projects exist (4 in the EU (Statista, 2023), without even touching on the other sources of energy that can be employed after the phase-out the fossil fuels and contribute to the phase-in, the energy transition and an actual action to address the global crisis, hence purposely omitting alternatives. Furthermore, it is misleading to claim that only one technology can play a pivotal role in solving climate change, as it doesn´t take into account the complexity of the realities and risks of the climate crisis. The paper, additionally, remarks that the biggest consequence the EU will face, if it doesn't implement large-scale CCUS, will be the failure of the Green Deal, emphasizing the massive contribution that the technology will play in reaching climate neutral Europe by 2050, again without questioning the perpetuated use of fossil fuels that will derive from that (biggest contributors to the global emissions, that have caused the crisis in the first place). Furthermore, among the reasons proposed by the paper, to the EU, there is the mentioning of renewable sources, but in an inclination that requires the deployment of CCUS, as it underlines how the technology will help the intermittency of wind and solar power generation.

Zero Emissions Platform

The projects derive from fossil fuel companies that promote the technology as the key solution to combat climate change. The main European platform on CCS, the Zero Emissions Platform has a majority of its members from the fossil fuel industry (Tab 6.)

Tab 6. Members of the Zero Emission Platform

AICIA/ University of Sevilla
BP: multinational oil and gas company.
BRGM/ Geosciences pour une Terre durable: French geological survey.
Clean Air Task Force: catalyzes the global development of climate-change technologies
E3G: independent climate change think tank.
EBN: European Business and Innovation Centre Network.
ENI S.p.A.: Italian multinational oil and gas company.
Equinor: Norwegian state-owned multinational oil and gas company.

ETUC: European Trade Union Confederation.
ExxonMobil: international oil and gas company.
EG Energy Europe: energy equipment solutions.
GeoEcoMar:research-development institute for marine geology and geoecology.
Hafslund Oslo Celsio: Norwegian renewable thermal energy.
Heidelberg Materials: building materials company.
Hydro: Norwegian aluminum and renewable energy company.
IFP Energies Nouvelles
Mitsubishi Heavy Industries: Japanese multinational, electrical equipment and electronic corporation.
National Technical University of Athens (NTUA)
Northern Lights JV DA: CCS project operated by Equinor, Shell and TotalEnergies.
Port of Rotterdam: Dutch CCS project.
Shell: investor-owned oil and gas company.
SINTEF: independent research organization.
Sustainable Decisions. Think tank based in UK.
The Bellona Foundation: independent non-profit organization to fight climate challenges.
TNO Energy: energy research center of the Netherlands.
TotalEnergies: French multinational energy and petroleum company.
University of Edinburgh (SCCS)

Based on the analysis of the platform and its historical background, the ZEP appears to be an EU fossil fuel industry group, masked as an advisory body to the EU. The first statement presented at the opening of the platform´s website, as reported above, presents the diversity of its members followed by a supposed balance in its advisory actions, however, a closer look at the members shows an imbalance of actors, as there are three universities: university of Sevilla, and University of Edinburgh and National Technical university of Athens (which would require a further investigation of the subsidies and funds they receive, as well as what projects and research they are commissioned to carry out, and a further in depth look at the affiliations of the professors employed). Additionally, there are six of the largest oil and gas companies: BP, ENI, Equinor, ExxonMobil, Shell and Total Energies, all big polluters, and direct responsible of the climate crisis. There is also the CCS project Norther Lights, operated by three of them (Equinor, Shell and Total Energies), while the second, the Port of Rotterdam is owned by EBN

and Gasunie, a Dutch natural gas infrastructure and transportation company. Two think tanks are included (E3G and Sustainable Decision) and to complete the picture, there are four research organizations, one trade union confederation and three equipment and materials companies.

Taking a look at the platform´s funding throughout 2009-2010 (which according to the ZEP´s secretariat was the same from 2006-2008), the EU trade associations pay the share of the utilities and equipment manufacturers, whereas the oil and gas membership is shared by five companies (Tab. 7).

Tab 7. ZEP´s funding 2009-2010

ZEP's funding 2009 - 2010	
European Commission	500,000
RWE, Vattenfall, EDF, EoN etc. (Via Eurelectric & VGB, the utilities trade associations)[37]	173,738
Alstom, Siemens, Ansaldo, General Electrics, Doosan, AE&E Austria (through EPPSA and EU Turbines)[38]	173,738
Shell	34,748
BP	34,748
Total	34,748
Schlumberger	34,748
StatoilHydro	34,748
Total	**1,021,214**

Source: Corporate European Observatory (2009)

By the Platform´s own admissions, CCS will not be commercially viable before 2020, hand will therefore not contribute to any emission reductions. (In 2023, at the time of writing of this paper, the technology is still under development, and not commercially available, leading to the suggestion that CCS has been used by the industry to delay meaningful action to combat climate change).

As reported by the European Observatory (2009), ZEP has effectively utilized its platform to advocate for increased research funding for CCS projects, led by its member companies, through the Framework Programmes. However, despite its official designation, ZEP has also

been involved in lobbying activities, providing guidance to Members of the European Parliament on the design of the EU Emissions Trading Scheme (ETS) as well as advising the EU on strategies for economic recovery from the financial crisis. Additionally, ZEP has been actively involved in the United Nations process.
As a matter of fact, ZEP´s past strategies have demonstrated to be effective, in securing public funding for CCS through lobbying in the following schemes:

- The EU Recovery Plan from the financial crisis (€1 bn);

- The New Entrants Reserve (NER) under the EU ETS, auctioning revenues from 150 to 300 million emission allowances which equals €1.8 - 3.7 bn, but the EU Commission calculates these could be worth €6 billion;

- The Seventh Framework Programme (€425 m).

In this way, the funding of CCS, has contributed to member States´ support for the coal industry, and this massive lobbying has succeeded in securing the financial commitments.
In 2019, another investigation by Corporate Europe Observatory, has found massive lobbying in EU climate and energy policies by the fossil fuel industry. Through the report there is the identification of industry lobby groups such as IOGP and CEFIC both part of the working group in the visionary paper proposed in 2023, as well as Shell companies. In particular, the report shows that the biggest lobby spenders was CEFIC with more than 10,000,000 Euros, and it´s worth highlighting that the member of this European Chemical Industry Council include major oil and gas companies such as BP, ExxonMobil, Repsol, Shell, Total. While Shell companies have spent circa 4,500,000 – 4,749,00 Euros in lobby activities. Shell is also actively engaged in various CCS initiatives, which include its operation of the government-supported Quest CCS facility in Canada for the Athabasca Oil Sands Project. Additionally, Shell has made investments in Australia's Gorgon liquefied natural gas CCS project (Gunderson et al., 2020).
The strategies logged 107 meeting of CEFIC in 2019 in decision- making meetings of the EU, and over 1,000 Commission advisory groups including CEFIC, ZEP, whose members coincide and include the major oil and gas industries previously indicated (CEO, 2019). In May 2020, it was also reported that IOGP wrote to MEPs to share its recommendations ahead of a recovery plan meeting, calling for public support for CCS.
More recent investigations conducted by Corporate Europe Observatory (2022), show that fossil fuel companies seem to be actively engaging with EU, pushing for more support for CCS

and CCUS, along with a proposal to make carbon removal tradable within the European Trading System.

Italian oil and gas company Eni, for example, is advocating for new incentive mechanisms to support carbon capture, utilization and storage (CCUS) initiatives. Eni seeks financial assistance, particularly for the initial high capital costs involved and to attract private investments. Essentially, this translates to using public funds to support fossil fuel companies. Eni is not alone in this endeavor, as ZEP also emphasizes the importance of carbon capture and storage infrastructure as a necessary prerequisite for carbon removal efforts. This message was likely reiterated at the ZEP conference in September 2021, where Eni discussed the challenge of incentivizing CO2 storage (CEO, 2022).

Several players in the fossil fuel industry are advocating for the integration of a carbon removals market with the European Union's ETS, which operates as a cap-and-trade system for emissions allowances and is mandatory for certain polluting sectors. Originally introduced by fossil fuel companies, the ETS has historically rewarded polluters and hindered progress in energy efficiency and renewable energy policies. Now, these companies appear to be seeking the modification of the ETS to sustain their profits and evade climate action. (CEO, 2022). IOGP, for instance, highlights that the current ETS does not acknowledge ´negative emissions´ resulting from carbon removal projects. They argue for the establishment of a carbon removal certificate market that recognizes negative emissions and aligns with the EU ETS. This move aims to incentivize greater investments in technology-based solutions. Similarly, EUROGAS urges the European Commission to ensure that carbon removal certificates become tradable within the ETS framework in the future (CEO, 2022).

In essence, the critical discourse analysis applied to the data provides an overview of documents/ websites production and location, authorship and audience as well as documents/ websites text (see research approach section).

The documents and websites with the exception of the EU´s official website, seem to have been produced by the members of the Forum and the Platform, the majority of whom belongs to the fossil fuel industry. They have been produced to guide, advise and influence the EU´s decision making process on the deployment of CCS. To combine frame analysis, hroughout the analysis, I have highlighted the presence of the three frames identified, summary below:

Tab 8. Summary of the frames.

FRAME	THEME	EXAMPLES
F1. LEGITIMACY	Reliance on international institutions like the IPPC, IEA, as well as compliance i.e., adherence to regulations, to scientifically back up the claims.	*Based on major energy system modelling studies by the European Commission, the IEA, and other, the EU will need to capture and utilize or store between 300 and 640 Mt of CO2 per year by 2050 to meet its climate goals, with most estimates towards the upper range. Several studies of 1.5 degrees Celsius compatible scenarios indicate that up to half of the CO2 stored in 2050 will be for the purpose of carbon dioxide remova*l" (EU CCUS Forum, 2023; pp. 3). *«ZEP supports the European Union's commitment to reach climate neutrality by 2050, defined as net- zero greenhouse gas (GHG) emissions by 2050. To this end, CCS technologies represent readily available and cost-efficient pathways for decarbonising industrial and energy sectors in the European Union»* (ZEP, 2023).
F2. TECHNOLOGICAL OPTIMISM	Faith in technological development, CCS as THE technology to mitigate climate change.	"*Without large-scale carbon capture, utilization and storage (CCUS), the EU will significantly fail to meet its Green Deal objective of being climate neutral by 2050*" (EU CCUS Forum, 2023; pp2).
F3. BRIDGE TECHNOLOGY	CCS as a bridge to a decarbonized energy system.	*«CCS technologies represent readily available and cost-efficient pathways for decarbonising industrial and energy sectors» (*ZEP, 2023)

OBSTRUCTION MASKED AS CCS

Through the consultation and analysis of the data presented, a critical eye has been cast at what is concealed or hidden in the proposed solution of CCS technology as the main answer to combat climate change and reach a net-zero Europe by 2050. Given the analysis of the official documents from the European Union, the linked Forum and Platform, and supporting reports, I confidently assert that the obstruction engine continues to pose barriers to the fossil fuels´ phase-out and the subsequent phase-in of the energy transition. In line with the theory presented, the incumbents can benefit from privileged access to politicians, civil servants and policy making processes. As a result, carbon capture and storage projects, initiatives and programmes, ostensibly aimed at reducing carbon emissions from burning fossil fuels, have had the effect of reinforcing the legitimacy of fossil fuel incumbents in tackling climate change and diverting resources away from actual renewable energy sources able to address the crisis.
All the CCS projects in operation or under development worldwide and in the EU, derive from the fossil fuel companies, which are actively promoting the technology as their tool to address the climate crisis. Furthermore, as can be seen through the analysis, the European Union´s sources about the further deployment of CCS come from the ZEP platform and the authors of the visionary paper, who, as discovered, belong to the fossil fuel industry, and whose lobbying activities have been systematically documented, representing the actors pushing for CCS in Europe, thus answering Q1. of this thesis. Furthermore, I am able to answer Q2 . by confirming that these actors have systematically used and continue to engage in strategies of obstruction (see summary of the frames) presented in the theoretical framework. Finally, I answer Q3. by stating that the strategies adopted by these actors are effectively contributing to the delay of the fossil fuels´phase-out, which, for the reasons illustrated in the introduction, will ultimately lead to climate degradation and the failure of climate efforts. Therefore, by confirming the three research questions, the hypothesis is confirmed by a deduction exercise, i.e., CCS represents a delay tactic employed by the obstructionists.
Supporting research and reports are presented to further substantiate these claims.

A study (van Alphen et al., 2007) suggests the favorable view of CCS embraced by the fossil fuel industry, followed by an international comparative study of stakeholder attitudes, comprising industry attitudes (Johnsson et al., 2010) revealed the generally supported belief of CCS´s entrance in the large-scale market in the next decades. This vision guided the fossil fuel industry, once the other generally supported belief was increasing i.e., the threat of climate

change, and the threat of the fossil fuel industry itself. As a matter of fact, the industry foresaw a potential economic benefit as it "*provides a vision of a carbon-constrained future*" (Gunderson et al., 2020; pp.2), that does not obstruct fossil fuel use. As Stephen (2009) stated "*CCS changed the way the fossil fuel industry envisioned their future challenges*" (pp.36).

The significant dependence of society on fossil fuels has made the technological concept of CCS a highly influential factor in shaping governmental action on climate change, hence the support of the European Union. Arranz (2015) conducted an examination of how CCS was portrayed and discussed by EU policymakers, NGOs, industry representatives, and government agencies during the Climate and Energy Package negotiations. The study reveals how an initially "enthusiastic" framing of CCS eventually became widely accepted and became hegemonic. This is of particular significance because, as highlighted by Arranz (2015), fossil fuel companies play a crucial role in shaping and popularizing specific narratives. Not only do these companies possess significant power in shaping the CCS discourse, but they also stand to benefit from CCS projects as they provide a justification for the continuation of fossil fuel extraction and combustion (Krüger, 2017). Therefore, as remarked in the background section, contribute to the reinforcement of carbon lock-ins, where the phase-out of fossil fuels remains unquestioned.

CCS has had a transformative impact on fossil fuel-dependent entities, particularly individuals and institutions in coal-dependent regions worldwide, by dispelling denial of climate change. It has offered a potential pathway to address climate change while still allowing for coal usage. With the recent shift towards increased reliance on natural gas, CCS similarly presents an opportunity to reconcile climate mitigation goals with the growth of natural gas power plants. However, this vision of CCS has also fostered complacency about the risks associated with sustained fossil fuel dependence. The substantial government funding allocated to CCS has diverted investment away from non-fossil fuel energy initiatives and technologies that offer more tangible and immediate societal benefits. As the imperative to reduce reliance on fossil fuels becomes more widely recognized, investments in CCS become perilous, as they further incentivize and legitimize continued fossil fuel usage, creating a false sense of optimism the current energy systems can be safely perpetuated (Stephens, 2009).

By embracing Stephens (2013) assertion that CCS investment is an additional fossil fuel subsidy, I argue in this paper that CCS is merely another strategy adopted by the fossil fuel industry, and CCS is yet another obstruction tool or the obstructive technology that hinders the transitions. Ceasing government investment in CCS is imperative, particularly in light of the fallacy that CCS is essential in ´solving´ climate change. Climate science has unequivocally

established that regardless of efforts made to reduce greenhouse gas emissions, the climate is irreversibly transitioning towards a new and distinct reality. Hence, any assertions that a specific technology such as CCS is pivotal in addressing climate change are misleading and contribute to a false sense of complacency regarding the actualities and risks associated with climate change. This complacency, combined with the optimism stemming from the belief that CCS offers a complete solution, is perilous and detracts from the urgent need for comprehensive systemic changes required to prepare for the evolving climate. The ongoing investment in CCS seems to foster unwarranted optimism in the face of the daunting global energy challenges we currently confront. Indeed, as Stephens (2013) states "*many assume that the economic, political, and social hurdles of advancing CCS are lower than the hurdles of moving away from fossil-fuels. CCS advocates frequently point out that CCS is preferable to moving away from fossil-fuels because CCS does not demand a radical alteration of national economies, global trade, or personal lifestyles. But radical systemic change in our energy systems is needed now more than ever before, and investments that slow down this transition are a dangerous distraction*". In this way, there is the perception of technological change to address the climate crisis, without the concomitant social change or political disruption, which has an appealing effect on politicians, in this case the embracement of the technology by the EU.

Consistent with the background presented, I argue that CCS represents the case where incumbent actors orient towards incremental niche innovation i.e., CCS, without shifting the basis of their power, in accordance with Newell (2002). In this way, the hegemony of these incumbents is not touched, and the status quo maintained.

Other scholars (Gunderson et al., 2020), have also identified the status quo maintenance as a frame adopted by the fossil fuel industry, when embracing CCS projects. The researchers (2020) have applied the frame to examine the fossil fuel industry. Given the fossil fuel companies dominant position in the analyzed documents and websites, in this thesis, the same framework can be applied here, to better understand how CCS is proposed to the EU as a ´technological fix´. The notion of status quo maintenance refers to the application or anticipated use of a ´technological fix´ to sustain the fundamental processes and social structures that characterize modern societies. In the case of CCS, this concept revolves around the burning of fossil fuels to maintain the existing order. The framework of status quo maintenance encompasses three distinct themes. First, there are explicit statements highlighting the pursuit and value of CCS as a means of maintaining the current societal order, referred to as ´system reproduction´. Second, there are specific claims that CCS enables the continuation of a fossil

fuel-based growing economy, often termed ´entropy optimism´ or "cornucopianism." Lastly, there is a preference for CCS when implicitly compared to alternatives that do not involve the continued fossil fuel usage, ´alternative repellence´. In addition, a negative aspect referred to as ´possibility blindness´, refers to the absence of content that presents scenarios or counterfactual futures that diverge from an economy powered by increasing energy throughput (Gunderson et al., 2020).

In accordance with the discourses of climate delay identified by Lamb et al., (2020), I position CCS within the identified discourse of ´disruptive change is not necessary: push non-transformative solutions´. CCS is a form of technological optimism to combat climate change, masked as a solution to solve the climate crisis, while it works as an obstruction of the latter, and is a way to maintain the fossil fuel hegemony and not make the slightsest change to the status quo, distracting from investments in other non-technological strategies or alternative technological ones.

Another aspect to consider is in the specific case of CCS technology, is that CCS deployment is largely inseparable from the use of fossil fuels. Especially the risk of lock-in that arises from CCS is due to its infrastructural inseparability from fossil fuel use.

For this reason, CCS is mainly expected to be retrofitted to fossil fuel-burning facilities like coal or gas power plants. It entails the construction of an entirely new infrastructure for capturing, transporting and storing CO2 underground as an integrated socio-technical system. Building new CCS infrastructure (capture facility, pipeline, and geological storage) requires massive capital investments with long lead times, which in turn increases significantly the infrastructural inertia of fossil fuel energy system, which reinforces the lock-in and makes the phase-out extremely difficult. Moreover, as argued by Asayama (2021), the risk of reinforcement of lock-in posed by the CCS technology deployment, becomes dangerous, when new fossil fuel power plants are constructed in the promise that the technology will be installed at a non-determined point in the future (so called capture readiness), but it will most likely never be deployed, leaving the plants unabated (Shackley and Thompson, 2012). The mask that CCS can wear is that it promises to decarbonize fossil fuel infrastructure while preserving it (Asayama, 2021).

This reinforced lock-in, is part of the delaying tactics employed by the fossil fuel companies.

As noted in the background section, CCS has significant instrumental value to the fossil fuels industry, serving as a strategic ´hedge´ to safeguard their interests and maintain the existing

status quo (Gunderson et al., 2020). This close connection between the fossil fuel industry's material interests and CCS is further evidenced by the fact that the countries leading in CCS demonstrations are primarily major producers of fossil fuels, such as Australia, Canada, Norway, and the United States (Gaede and Meadowcroft, 2016; Reiner, 2016). Notably, CCS coupled with enhanced oil recovery (EOR) plays a particularly crucial role for these fossil fuel-rich nations, as it provides a justification for the continued extraction of vast fossil fuel reserves. From a political standpoint, the significant sunk costs resulting from the substantial investment made in CCS have created a challenging ´political lock-in´ situation. Governments that have already allocated significant amounts of money, along with considerable political capital, to promote CCS face difficulties in withdrawing their support. Moreover, the billions of dollars already spent have fostered the formation of a robust CCS advocacy coalition, comprising various institutions and individuals around the world. These stakeholders have professional responsibilities that include advocating for increased government funding for CCS.

The prevailing technological optimism among these CCS advocates has often overshadowed the consideration of the societal risks associated with CCS investment and the potential societal benefits of redirecting investment to alternative strategies that are non dependent on fossil fuels (Stephens, 2013).

From the website of the IEA there is a surging emphasis on the role of CCUS, in fact the article published this year (IEA, 2023), The year 2022 witnessed significant advancements in carbon capture, utilization, and storage (CCUS), marking it as a strong period for this technology. A remarkable 140+ new CCUS projects were announced, resulting in an 80% increase in planned storage capacity and a 30% rise in capture capacity. Notably, CCUS initiatives emerged in seven additional countries across central and southern Europe, the Middle East, and Southeast Asia, expanding the global count of countries committed to developing CCUS to 45. The growing recognition among governments and companies of the pivotal role of CCUS in achieving decarbonization targets has spurred investments in CO2 management infrastructure. Since 2021, governments worldwide have pledged over USD 6 billion towards the development of transport and storage facilities for CO2. Noteworthy contributions have been made by countries such as the United States, the European Union, and Australia. The momentum behind CCUS is further underscored by the significant increase in the number of CCUS hubs under development. With over 140 CCUS hubs currently in progress, the figure has tripled since 2021, reflecting the growing emphasis on deploying this technology to address

carbon emissions and advance sustainable practices. This represents a general focus put on the technology of CCS/CCUS from international institutions such as IEA, which reinforces the legitimacy of the fossil fuel incumbents´ push for the technology as an essential measure to address the crisis.

The IEA (2023) additionally recognizes that oil and gas companies have historically played a prominent role in leading the development of CCUS technologies. They have taken charge of the operation of five out of the eight dedicated CO2 storage projects currently in operation, as well as managing the majority of existing CO2 pipelines. Notably, Exxon Mobil, Occidental, Petrobras, and Chevron collectively contribute to over half of the current operational carbon capture capacity. Oil and gas companies continue to maintain strong involvement in CCUS initiatives "*CCUS is likely to be an important component to support the transition of producing economies" (*IEA, 2023). It continues stating that the integration of CCUS is expected to be a vital component in facilitating this transition. This perspective, among others, will be thoroughly examined in the upcoming publication by the IEA on the oil and gas industry and COP28. This publication will provide valuable insights and guidance on the role of oil and gas producers in achieving a net-zero emissions pathway, thereby contributing to shape the discussions at COP28 (IEA, 2023). (Once again there is the recurrence of F1. Legitimacy, and F3. Bridge technology).

Through this acknowledgment from the IEA, oil and gas industries find a legitimate source to continue their efforts of obstructing the transitions, through the push of investments in CCS. The incumbent's role in helping to achieve the transition, considered the reasons previously explained, cannot be the development of CCS projects. Whereas their help could be a progressive phase-out from the energy system, to leave space for the phase-in of renewable energy sources. Or, as Grasso and Heede (2023) note, given the moral responsibility of fossil fuel companies in the harm caused to the climate, morally based reparations would rectify their culpability. Thus, actually helping to address the climate crisis.

For what concerns the apparatus around the technology, Nosko and Usiak (2023) report that several entities position themselves as NGOs, but their objectives appear to be closely aligned with business alliances. One such example is the Global CCS Institute Ltd., which was officially registered as a think tank (GCCSI, 2022). However, upon examining their website, it became apparent that they functioned more as a professional association. This was evident from

its membership requirements, which stated that organizations must engage in business or activities where the promotion of carbon capture and storage (CCS) is not merely a secondary aspect of their core operations (GCCSI, 2021). European NGOs play a crucial role in facilitating coordination and representing the perspectives of national organizations and citizens in the decision-making process. They actively contribute to the development and implementation of environmental and climate change policies, particularly in the context of the transition to clean energy. NGOs engage in preparatory work, participate in expert groups, and conduct research and studies to provide valuable feedback, enhance the knowledge base, and shape European policy. Moreover, NGOs are instrumental in raising awareness among the general public and promoting environmental and climate education. They play a significant role in disseminating information, organizing campaigns, and fostering public engagement to increase understanding and mobilize support for environmental and climate-related issues. Through their efforts, NGOs help to empower individuals and communities to make informed choices and take meaningful action towards sustainability (Nosko and Usiak, 2023). In the case of the Global CCS Institute, it plays a significant role in supporting the oil and gas companies, hence, thus working as an obstructionist of the energy transition.

(Given these considerations, I would argue that the global CCS Institute might be a conservative think tank, that could fit the characteristics outlined in the ´structure of obstruction´. further research in this area could be verify such assertion).

´All talk, little action´ discourse of delay identified by Lamb et al., (2020) is also present, for example in the case of the Norwegian oil and gas now energy company Equinor, according to a report by Oil International (2023). Equinor remains committed to advancing its exploration and production activities by seeking approval for new projects. In 2022 alone, the company sanctioned 13 extraction projects worldwide and acquired 26 exploration and production licenses in Norway. Moving forward, Equinor is on track to approve additional extraction projects that could potentially contain around 800 million barrels of oil equivalent reserves in 2023. If these plans are realized, Equinor could secure the eighth position globally and rank third among European-based companies, trailing behind Eni and TotalEnergies, in terms of conventional oil and gas reserves approved for development in 2023. Equinor's own disclosures indicate that a significant portion of its gross capital expenditures, approximately 86%, amounting to USD 9.6 billion in 2022, was allocated to oil and gas activities. In contrast, only 14% was directed towards "renewables and low carbon solutions." However, it should be noted

that the proportion of capital expenditure invested in fossil fuels is actually higher, as Equinor's definition of "low carbon" includes technologies such as CCS and fossil gas-based hydrogen production, which still contribute to emissions. In terms of renewable energy, including wind, solar, and energy storage technologies, Equinor reported a mere USD 0.3 billion in capital expenditures for 2022, compared to USD 8.3 billion for oil and gas exploration and production segments. Equinor has set targets to reduce net emissions by 2030, but these goals only cover scope 1 and 2 emissions, while scope 3 emissions are omitted. To achieve these limited and incomplete targets, Equinor plans to rely on CCS, claiming that it is essential for the alignment with the goals of the Paris Agreement. Furthermore, Equinor describes so-called ´blue hydrogen´ produced from fossil gas as a "low carbon solution." However, a 2022 report by InfluenceMap revealed that Equinor was one of the companies intensively lobbying to secure a future for fossil gas within the policies of the EU Green Deal. Gunderson et al., (2022) interpret technological optimisms, omissions and risk minimization as forms of greenwashing especially with reference to the fossil fuel companies, who present a solution, while ignoring any potential drawbacks to convince the public of their dedication and successful efforts to restore or protect the environment.

The Climate Action Tracker (CAT) (2023) findings also indicate that prominent oil and gas producers are endorsing technologies such as CCS that simply enable the prolonging of the production of fossil fuels, diverting attention from the urgent need to halve greenhouse gas emissions by 2030 and decrease global fossil fuel production. From the report it is evident that CCS serves as a solution to sustain oil and gas industries. The United Arab Emirates (UAE), being the world's seventh largest oil and fifteenth largest fossil gas producer, has officially advocated for an "emissions-free" fossil fuel agenda, promoting the use of CCS in the energy sector rather than phasing out oil and gas. And as shown in this paper, in a sustainable pathway towards limiting global warming to 1.5°C, CCS coupled with fossil fuels does not play a significant role in decarbonizing the energy sector. Renewable energy sources offer a much cheaper alternative with a significantly lower environmental impact. Moreover, it is important to note again that CCS is currently far from reaching the necessary scale and commercial viability required to achieve substantial emissions reductions. Technological and cost challenges present significant barriers. Apart from the UAE, other major economies that heavily rely on fossil fuel exports, including the United States, Canada, Australia, and Saudi Arabia, are also advocating for CCS as a means to reduce emissions from oil and gas production and consumption.

CONCLUSION

In response to demands to address the climate crisis by phasing out fossil fuels, oil and gas companies have evolved over time to publicly acknowledge the validity of climate science and express their commitment to reducing carbon emissions. From primary obstruction, i.e. climate science denial, they have moved to a secondary form of obstruction involving delaying tactics and strategies, while at the same time maintaining memberships in trade associations that actively promote misinformation about climate science and work to obstruct climate action, while continuing to extract and burn fossil fuels. This deceptive "two-faced" on climate change is pervasive within the industry. While scientific research both outside and within their own facilities confirms the reality and risks of climate change, these companies fund disingenuous scientific studies and think tanks to spread misinformation and uncertainty about climate change. In this thesis, I argue that the fossil fuel industry continues these efforts in the secondary form of obstruction, through the subtle and strategic use of CCS technology. CCS technology seems to fit perfectly into the niche technologies that drive the phase-in of the energy transition. Here I raise a critique about the consideration of CCS as a niche technology capable of phasing in the energy transition, because it seems to represent a success story for the obstructionists, whose strategic skills have led academics, civil society and policymakers to recognize the technology as a mitigation option because of the functions it absolves, hence I argue that it is a delaying tactic disguised as a niche technology that enables the perpetuation and lock-in of fossil fuels. This could be a major problem as it diverts research, policy and media framing of CSS into an area where it does not belong, i.e. the technology for phase-in. Given the recent increase in proposals for CCS projects in the EU, the data examined suggests that this subtle strategy is being used effectively through the recurrent subtle frames around it, namely legitimacy, technological optimism and bridge technology, which are being promoted by the obstructionists themselves, as the analysis shows that they are mainly behind the documents and websites. Furthermore, the analysis shows that those proposing and promoting CCS technology are the fossil fuel industries, and that this technology has been developed by their scientific experts as a solution. However, the solution was presented as climate change, whereas in reality, given the findings of this thesis and research in the field, the solution was the survival of the industry.

By transforming fossil fuel companies into the solution rather than the problem (phase-out), the frames of legitimacy, technological optimism, compliance, omission and bridging technology, a reinforced carbon lock-in emerges, that allows obstructionists and mainly fossil fuel companies to protect their existence and profitability despite the damage to the planet.
The frames used seem to be designed to shift the focus away from the environmental damage caused by the fossil fuel industry in order to appease everyone else.
Any kind of alternative organization of society that does not involve reliance on fossil fuels is dismissed because it is omitted from the frames. I argue that this could still be an act of denial, because by omitting renewable sources from the frames, the industry is denying an alternative society to the current one.
Therefore, by using CCS and disguising it as a niche technology, the actors envisaged are able to reinforce the systematic barriers that operate in an interconnected way in the carbon network, where existing lock-ins are maintained and strengthened, and the power and hegemony of the fossil fuel regime remains untouched.
Consistent with the theory presented, incumbent industry players often enjoy privileged relationships with politicians, government officials, and policy-making procedures. Consequently, projects, initiatives, and programmes centered around carbon capture and storage, ostensibly aimed at reducing carbon emissions from fossil fuel combustion, end up bolstering the credibility of fossil fuel incumbents in their efforts to address climate change, increasing their legitimacy, and reinforcing their power. This diverts resources away from renewable energy sources that have the potential to effectively tackle the crisis.

CCS constituting a climate delay tactic employed by the obstructionists to protect the fossil fuel companies can also be seen in the actions taken by the major fossil fuel companies towards oil and gas production. To meet the Paris Agreement goal, oil gas and coal production need to be entirely phased out. As suggested by CAT (2023) countries would need to implement country-specific timelines for phasing out oil and gas production. However, information regarding specific dates for ending production is limited. According to a study conducted by Calverley and Anderson in 2022, developed nations should aim to phase out oil and gas production by 2034, taking equity considerations into account. To ensure a managed and equitable transition, governments must implement a set of minimum measures to facilitate the phase-out of oil and gas production while prioritizing a just transition:

- Immediately end new oil and gas exploration and production.

- Set end dates for oil and gas production, with developed countries leading the way.
- Immediately end subsidies for oil and gas production.
- Immediately end all international public finance for fossil fuels.

Implementing these measures is crucial for establishing a comprehensive and well-defined vision for a managed transition away from oil and gas. It is imperative for the world's leading oil and gas producers to take proactive steps towards oil and gas production strategies aligned with the goals of the Paris Agreement. Advanced economies, in particular, should commit to phasing out their reliance on oil and gas production and instead focus on transitioning to renewable energy sources. Simultaneously, it is crucial for these economies to accelerate the adoption of renewable energy technologies. By investing in and prioritizing the development of renewable energy sources, such as wind, solar, and geothermal can effectively replace fossil fuels (CAT, 2023). Indeed, in this report there is evidence that CCS is not part of the technologies; and it remains a delay tactic of the phase-out of fossil fuels, employed by the obstructionists. The responsibility lies with the largest oil and gas producers to lead the transition and demonstrate their commitment to mitigating climate change. By embracing the phase-out of oil and gas production and embracing renewable energy alternatives, these economies can play a significant role in combating climate change and fostering a greener and more resilient global energy system. Furthermore, on a moral case about the economic cost of the climate crisis, who is responsible and who should bear the costs of it, Grasso and Heede (2023) calculated that the world´s top fossil fuel companies owe at least $209 bn in annual climate reparations to the communities damaged by their core business and the obstruction machine meticulously constructed around it. The research draws upon the carbon majors database (used in the introduction of this paper), which tracks the emissions of specific oil, gas, and coal companies since 1988, year of the establishment of the IPCC and turning point for the industry assertions of scientific uncertainty regarding the climate crisis, as they became untenable.

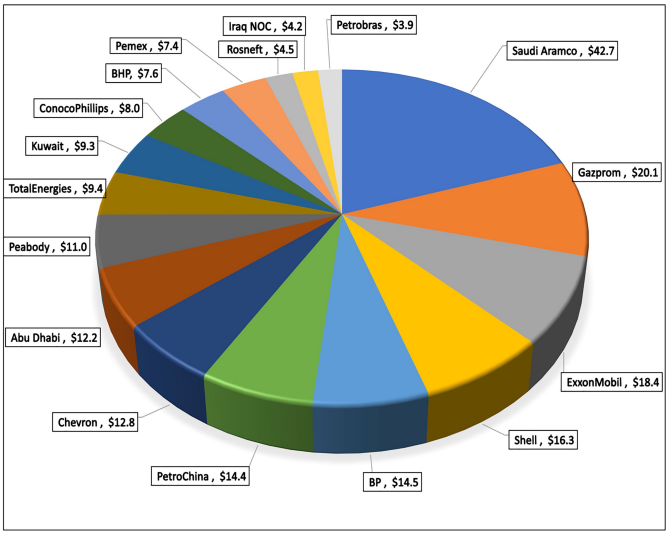


Fig. 7 Fossil fuel companies' average annual reparations, 2025-2050 (billion US$, current)

Source: Grasso and Heede (2023) Time to pay the piper: Fossil fuel compnaies´reparations for climate damages. One Eart, Volume 6, Issue 5, 459-463

Further research in this area is needed, both at the European level and globally, to identify and hold accountable these obstructionists and their interconnected, well-orchestrated actions, strategies and tactics that stand in the way of the fossil fuel phase-out, which in the case of CCS serve as a distraction from the real actions. To unravel and disrupt the current hegemonic power of fossil fuels, which means disrupting the obstacles that stand in the way of the energy transition.

REFERENCES

ACF (2020) Fossil fuel money distorting democracy, Australian Conservation Foundation, Melbourne, Australia.

Almiron, N., Rodrigo-Alsina, M., & Moreno, J. A. (2022). Manufacturing ignorance: think tanks, climate change and the animal-based diet. *Environmental Politics*, *31*(4), 576-597.

Anderson, K., & Broderick, J. (2017). *Natural gas and climate change*. University of Manchester.

Arranz, A.M. (2015) Carbon capture and storage: Frames and blind spots, Energy Policy 82, 249–259.

Asayama, S. (2021). The oxymoron of carbon dioxide removal: escaping carbon Lock-In and yet perpetuating the fossil status quo?. *Frontiers in Climate*, 72.

Baker, L. Newell, P. Phillips, J. (2014) The political economy of energy transitions: the case of South Africa, New Political Economy 1-28, https://doi.org/10.1080/13563467.2013.849674.

Begley, S. (2007). Global-warming deniers: a well-funded machine. *Newsweek Magazine*, (13).

Bergek, A., Hekkert, M., Jacobsson, S., Markard, J., Sandén, B., & Truffer, B. (2015). Technological innovation systems in contexts: Conceptualizing contextual structures and interaction dynamics. *Environmental innovation and societal transitions*, *16*, 51-64.

Blommaert, J & Bulcaen, C. (2000). Critical Discourse Analysis. Annual Reviews Publishers. Vol. 29: 447-466.

Bloom, D. (2020). Top Tory says we should all carry on taking short flights despite climate crisis. Health Secretary Matt Hancock said Brits shouldn't cut down on short-haul, domestic flights within the UK despite his party's pledge to cut net carbon emissions to zero by 2050.

Bowen, G. A. (2009). Document analysis as a qualitative research method. Qualitative Research Journal, 9(2), 27-40. doi:10.3316/QRJ0902027

Boykoff, M. T. (2011). *Who speaks for the climate?: Making sense of media reporting on climate change*. Cambridge University Press.

Browne, B. Swanne, T. (2017) Money for nothing, The Australia Institute, Canberra.

Brulle, R. J. (2014). Institutionalizing delay: foundation funding and the creation of US climate change counter-movement organizations. *Climatic change*, *122*, 681-694.

Brulle, R., & Aronczyk, M. (2019). Environmental countermovements: organised opposition to climate change action in the United States. In *Routledge handbook of global sustainability governance* (pp. 218-230). Routledge.

Brulle, R.J. (2018) The climate lobby: A sectoral analysis of lobbying spending on climate change in the USA, 2000 to 2016, Climatic Change 149(3) 289-303, https://doi.org/10.1007/s10584-018-2241-z.

Caldecott, B. (2018) Stranded assets and the environment: Risk, resilience and opportunity, Routledge, London.

Calverley, D. and Anderson, K. (2022) Phaseout Pathways for Fossil Fuel Production Within Paris-compliant Carbon Budgets

CAN (2021) Climate Action Network Position: Carbon Capture, Storage and Utilization January 2021

Carbon capture, Utilization and Storage (CCUS) U.S. Department of Energy (last visited, May 2023).

Carroll, W. K. (2020). Fossil capitalism, climate capitalism, energy democracy: The struggle for hegemony in an era of climate crisis. *Socialist Studies/Études Socialistes*, *14*(1).

CAT (2023). COP28 must focus on oil and gas phase-out, not distractions like CCS. Published 08/06/2023

CCUS Forum (2023) A vision for Carbon Capture, Utilization and Storage in the EU

CEO (2019). Corporate Europe Observatory: Fossil fuel industry´s lobbying in EU climate and energy policies.

CEO (2022) The Deadly Climate Gamble. Dirty Energy Bets on Unproven `Carbon Removals`to keep fossil fuels flowing. Written by Rachel Tansey, with contributions from belen Balanya. Edited by Kat Ainger.

CIEL (2022) *Confronting the Myth of Carbon-Free Fossil Fuels: Why Carbon Capture Is Not a Climate Solution* by CIEL is licensed under the Creative Commons Attribution-NoDerivs-NonCommercial 1.0 Generic License. To view a copy of this license, visit *http://creativecommons.org/ licenses/by-nd-nc/1.0/* or send a letter to Creative Commons, 444 Castro Street, Suite 900, Mountain View, California, 94041, USA.

Cohen, S. (2013). *States of denial: Knowing about atrocities and suffering*. John Wiley & Sons.

Corporate Europe Observatory (2009) Public funds used to lobby for fossil fuel in Copenhagen European tax payers foot the bill for promoting global expansion of fossil fuel

Cox, R. W. (1983). Gramsci, hegemony and international relations: an essay in method. *Millennium*, *12*(2), 162-175.

Crouch, C. (2011). *The strange non-death of neo-liberalism*. Polity.

CSSN (2021) CSSN Briefing. CSSN Primer 2021:1 The Structure of Obstruction: Understanding Opposition to Climate Change Action in the United States

Davidson, J. (2020) ExxonMobil lobbyist tried to water down European Green Deal, 9 March 2020. https://www.ecowatch.com/european-green-deal-exxon-lobbyists-2645438998.html.

DiMuzio T (2012) Capitalizing a future unsustainable: Finance, energy and the fate of market civilization. Review of International Political Economy 19: 363–388.

Dunlap, R. E., & Brulle, R. J. (2020). Sources and amplifiers of climate change denial. *Research Handbook on Communicating Climate Change*, 49-61.

Dunlap, R. E., & Jacques, P. J. (2013). Climate change denial books and conservative think tanks: Exploring the connection. *American Behavioral Scientist*, *57*(6), 699-731.

Dunlap, R. E., & McCright, A. M. (2015). Challenging climate change. *Climate change and society: Sociological perspectives*, *300*.

EC (2023) https://single-market-economy.ec.europa.eu/publications/net-zero-industry-act_en

Ed Collins – Influence Map press release: The World´s most obstructive Companies on Climate policy 4th November 2021

Ekberg, K., Forchtner, B., Hultman, M., & Jylhä, K. M. (2022). *Climate Obstruction: How Denial, Delay and Inaction are Heating the Planet*. Taylor & Francis.

Entman, R.M. (1993) Framing: toward clarification of a fractured paradigm, J. Commun. 43 (4) 51–58.

Erickson, P., Kartha, S., Lazarus, M., & Tempest, K. (2015). Assessing carbon lock-in. *Environmental Research Letters*, *10*(8), 084023.

EU Council (2008) Council Conclusions on preparations for the 14th session of the Conference of the Parties (COP 14) to the United Nations Framework Convention on Climate Change (UNFCCC) and the 4th session of the Meeting of the Parties to the Kyoto Protocol (CMP 4) (Poznań, 1 to 12 December 2008)

EU Green Deal (2019) https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

Fairclough, N. (2013) Critical Discourse Analysis: The Critical Study of Language, Routledge.

Fairclough, N. (2013). Critical discourse analysis and critical policy studies. *Critical policy studies*, *7*(2), 177-197.

Fonseca, M. (2016) Gramsci's critique of civil society: Towards a new concept of hegemony, Routledge, New York, NY.

Ford, A. Newell, P. (2021) Regime resistance and accommodation: Toward a neo- Gramscian perspective on energy transitions, Energy Res. Soc. Sci. 79, 102163,

Ford, A. (2020) Regime resistance and accommodation in sustainable energy transitions, University of Melbourne.

Gaede, J., & Meadowcroft, J. (2016). Carbon capture and storage demonstration and low-carbon energy transitions: Explaining limited progress. *The palgrave handbook of the international political economy of energy*, 319-340.

GCCSI (2023) https://www.globalccsinstitute.com

Geels, F. W. (2014). Regime resistance against low-carbon transitions: introducing politics and power into the multi-level perspective. *Theory, culture & society*, *31*(5), 21-40.

Geels, F.W., 2002. Technological transitions as evolutionary reconfiguration processes: a multi level perspective and a case study. Research Policy 31 (8–9), 1257–1274.

Gillard, R. (2016). Unravelling the United Kingdom's climate policy consensus: the power of ideas, discourse and institutions. Global Environmental Change, 40, 26–36.

Global CCS Institute (2022) The global status of CCS https://status22.globalccsinstitute.com/wp-content/uploads/2023/03/GCCSI_Global-Report-2022_PDF_FINAL-01-03-23.pdf

Goffman, E. (1974) Frame analysis: An essay on the organization of experience, Harper and Row, New York.

Goulet, F., & Vinck, D. (2015). Innovation through withdrawal contribution to a sociology of detachment. *Revue française de sociologie*, *11*, 21-44.

Graber, D.A. (1988). *Processing the news: Howpeople tame the information tide* (2nd ed.). New York: Longman.

Gramsci A (1971) Selections from the Prison Notebooks. New York: International Publishers.

Grasso M. and Heede R. (2023) Time to pay the piper: Fossil fuel compnaies´reparations for climate damages. One Eart, Volume 6, Issue 5, 459-463

Grasso, M. (2022). *From big oil to big green: Holding the oil industry to account for the climate crisis*. MIT Press.

Gunderson, R., Stuart, D., & Petersen, B. (2020). The fossil fuel industry's framing of carbon capture and storage: Faith in innovation, value instrumentalization, and status quo maintenance. *Journal of Cleaner Production*, *252*, 119767.

Haas, T. (2019) Struggles in European Union energy politics: A gramscian perspective on power in energy transitions, Energy Research & Social Science 48, 66-74, https://doi.org/10.1016/j.erss.2018.09.011.

Hansson, A., Bryngelsson, M., 2009. Expert opinions on carbon dioxide capture and storage – a framing of uncertainties and possibilities. Energy Policy 37, 2273– 2282.

Heede R. (2020) Carbon Majors 2018 Data Set. 2023. 2020 (released December 2020) https://climateaccountability.org/carbonmajors_dataset2020.html. Updated to 2022 by the author

Hekkert, M. P., Suurs, R. A., Negro, S. O., Kuhlmann, S., & Smits, R. E. (2007). Functions of innovation systems: A new approach for analysing technological change. *Technological forecasting and social change*, *74*(4), 413-432.

Holden, E. (2020) How the oil industry has spent billions to control the climate change conversation, The Guardian, 8 January 2020.

Huet, N. Euronews (2022) Europe´s energy crisis is boosting green hydrogen. Is it finally a real alternative? (euronews.next, 24/11/2022).

IEA (2023) https://www.iea.org/fuels-and-technologies/carbon-capture-utilisation-and-storage

IEA (2023), How new business models are boosting momentum on CCUS, IEA, Paris https://www.iea.org/commentaries/how-new-business-models-are-boosting-momentum-on-ccus, License: CC BY 4.0

IPCC 2022 *AR6 Climate Change 2022: mitigation of Climate Change, the Working Group III Contribution* (Intergovernmental Panel on Climate Change) (available at: www.ipcc.ch/report/sixth-assessment-report-working- group-3/)

IPCC, 2023: Summary for Policymakers. In: Climate Change 2023: Synthesis Report. A Report of the Intergovernmental Panel on Climate Change. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, 36 pages. (in press).

IPCC, Global Warming of 1.5 ^{O}C, UNFCC, 2018.

Johnsson, Filip, Reiner, David, Itaoka, Kenshi, Herzog, Howard, (2010). Stakeholder attitudes on carbon capture and storagedan international comparison. Int. J. Greenh. Gas Contr. 4 (2), 410e418.

Jolly, J. The Guardian (2020) Hydrogen fuel bubbles up at the agenda as investment rocket (The Guardian, 28/06/2020).

JRC EC (2022) https://commission.europa.eu/about-european-commission/departments-and-executive-agencies/joint-research-centre_en

Kahneman, D., & Tversky, A. (1984). Choice, values, and frames. *American Psychologist. 39,* 341-350.

Kirk, K. (2020) Fossil fuel political giving outdistances renewables 13 to one, 6 January 2020. https://yaleclimateconnections.org/2020/01/fossil-fuel-political-giving-outdistances-renewables-13-to-one/.

Klein, N. (2014). *This changes everything: Capitalism vs. the climate.* London: Penguin books.

Kotch, A. (2020) Members of congress own up to $93 million in fossil fuel stocks, 3 January 2020. https://readsludge.com/2020/01/03/members-of-congress-own-up-to-93-million-in-fossil-fuel-stocks/.

Krüger, T., (2017). Conflicts over carbon capture and storage in international climate governance. Energy Policy 100, 58e67.

Laclau E and Mouffe C (1985) Hegemony and Socialist Strategy: Towards a Radical Democratic Politics. London: Verso.

Lamb, W. F., Mattioli, G., Levi, S., Roberts, J. T., Capstick, S., Creutzig, F., Minx, J. C., ... & Steinberger, J. K. (2020). Discourses of climate delay. *Global Sustainability*, *3*, e17. doi:10.1017/sus.2020.13.

Leach, M., Scoones, I., & Stirling, A. (2010). Governing epidemics in an age of complexity: Narratives, politics and pathways to sustainability. *Global Environmental Change*, *20*(3), 369-377.

Lee, D. Hess, D.J. (2019) Incumbent resistance and the solar transition: Changing opportunity structures and framing strategies, Environmental Innovation and Societal Transitions 33, 83-195, https://doi.org/10.1016/j.eist.2019.05.005.

Lennon, M., & Scott, M. (2017). Opportunity or threat: Dissecting tensions in a post-carbon rural transition. *Sociologia Ruralis*, *57*(1), 87-109.

Levy DL and Egan D (2003) A neo-Gramscian approach to corporate political strategy: Conflict and accommodation in the climate change negotiations. Journal of Management Studies 40: 803–829.

Levy, D. L. Egan, D. (2003) A neo-Gramscian approach to corporate political strategy: conflict and accommodation in the climate change negotiations, J. Manage. Stud. 40, 803–829, https://doi.org/10.1111/1467-6486.00361.

Levy, D. L., & Newell, P. J. (2002). Business strategy and international environmental governance: Toward a neo-Gramscian synthesis. *Global environmental politics*, *2*(4), 84-101.

Levy,D.L. (2005) Business and the evolution of the climate regime ,in:D.L.Levy,P.J. Newell (Eds.), *The Business of Global Environmental Governance*, Cambridge, MA: MIT Press, pp. 73-104.

Locke, T. (2004). Critical Discourse Analysis. London: Cromwell Press

Lucke, A. (1996). Text and Discourse Analysis. New York: American Educational Research Association. Vol. 21:3-17.

Mann, M. E. (2021). *The new climate war: The fight to take back our planet.* Melbourne; London: Scribe.

McCright, A. M., & Dunlap, R. E. (2003). Defeating Kyoto: The conservative movement's impact on US climate change policy. *Social problems*, *50*(3), 348-373.

McGregor, S.L.T. (2010). Critical Discourse Analysis: A Primer. Halifax. Mount Saint Vincent University

McKie, R. E. (2019). Climate change counter movement neutralization techniques: A typology to examine the climate change counter movement. *Sociological Inquiry*, *89* (2), 288–316. doi:10.1111/soin.12246

McKie, R. E. (2021). Obstruction, delay, and transnationalism: Examining the online climate change counter-movement. *Energy Research & Social Science*, *80*, 102217. doi:10.1016/j.erss.2021.102217

Meadowcroft, J., Langhelle, O., (2009). Caching the Carbon: The Politics and Policy of Carbon Capture and Storage. Edward Elgar Publishing, Cheltenham, UK.

Megura, M., & Gunderson, R. (2022). Better poison is the cure? Critically examining fossil fuel companies, climate change framing, and corporate sustainability reports. *Energy Research & Social Science*, *85*, 102388.

Monbiot, G. (2017). *How did we get into this mess? Politics, equality, nature.* London: Verso.

Newell, P. Martin, A. (2020) The role of the state in the politics of disruption and acceleration, EIT Climate KIC, London, 2020.

Newell, P. (2019) Trasformismo or transformation? The global political economy of energy transitions, Rev. Int. Pol. Econ. 26

Newell, P. (2021). *Power shift: The global political economy of energy transitions*. Cambridge University Press.

Newell, P., & Bulkeley, H. (2017). Landscape for change? International climate policy and energy transitions: evidence from sub-Saharan Africa. *Climate Policy*, *17*(5), 650-663.

Newell, P., & Bumpus, A. (2012). The global political ecology of the clean development mechanism. *Global Environmental Politics*, *12*(4), 49-67.

Newell, P., & Paterson, M. (2010). *Climate capitalism: global warming and the transformation of the global economy*. Cambridge University Press.

Nosko A. and Ušiak J. (2023) Effects of COVID-19 on civil society voices in European energy and climate policy, Energy Policy, Volume 174, 113421, ISSN 0301-4215,

Nurdiawati, A., & Urban, F. (2022). Decarbonising the refinery sector: A socio-technical analysis of advanced biofuels, green hydrogen and carbon capture and storage developments in Sweden. *Energy Research & Social Science*, *84*, 102358

Oil Change International (2022) The Aggressive Explorer: How Norway's Rapid Ramp-up of Oil and Gas Licensing Is Incompatible with Climate Leadership. Available at: https://priceofoil. org/2022/02/08/norway-briefing-2022/

Oil Change International (2023) Big Oil Reality Check 2023 — An Assessment of TotalEnergies, Eni, and Equinor's Climate Plans. 25 May 2023

FOreskes, N., & Conway, E. M. (2010). Defeating the merchants of doubt. *Nature*, *465*(7299), 686-687.

Paterson M (2021) 'The End of the fossil fuel age'? Discourse politics and climate change political economy. New Political Economy: 26: 923–936.*Rev.* 94(2):251–67

Pearse, N. (2019). *An illustration of deductive analysis in qualitative research*. Kidmore End: Academic Conferences International Limited. doi:https://doi.org/10.34190/RM.19.006

Peeters, P., Higham, J., Kutzner, D., Cohen, S. & Gössling, S. (2016). Are technology myths stalling aviation climate policy? Transportation Research Part D, 44, 30–42.

Phelan, L. Henderson-Sellers, A. Taplin, R. (2013) The political economy of addressing the climate crisis in the earth system: Undermining perverse resilience, New Political Economy 18(2) 198-226, https://doi.org/10.1080/13563467.2012.678820.

Pierson P. 2000. Increasing returns, path dependence, and the study of politics. *Am. Polit. Sci.* RAN (2020) Banking on Climate Change: Fossil Fuel Finance Report 2020. San Francisco, CA: Rainforest Action Network.

Pierson, P. (2000). Increasing returns, path dependence, and the study of politics. *American political science review*, *94*(2), 251-267.

Powell, J. L. (2011). *The inquisition of climate science*. Columbia University Press.

Pringle, A., & Robbins, D. (2022). From denial to delay: Climate change discourses in Ireland. *Administration*, *70*(3), 59-84.

Reiner, D. M. (2016). Learning through a portfolio of carbon capture and storage demonstration projects. *Nature Energy*, *1*(1), 1-7.

Rogers, R., Malamcharuvil-Berkes, E., Mosley, M., Hui, D and O' Garro Joseph, G.(2005). Critical Discourse Analysis in Education: A Review of the Literature. Washington. Sage Publications.

Rosenbloom, D. and Rinscheid, A. (2020) Deliberate decline: An emerging frontier for the study and practice of decarbonization. Wiley Interdisciplinary Reviews: Climate Change, 11(6), e669.

Rosenbloom, D., & Rinscheid, A. (2020). Deliberate decline: An emerging frontier for the study and practice of decarbonization. *Wiley Interdisciplinary Reviews: Climate Change*, *11*(6), e669

Schlichting, I (2013) Strategic framing of climate change by industry actors: A meta- analysis, Environ. Commun. 7 (4) 493–511.

Schneider, J. J., Schwarze, S., Bsumek, P. K., & Peeples, J. (2016). *Under pressure: coal industry rhetoric and neoliberalism*. London: Palgrave Macmillan.

Selby, J. (2019). The Trump presidency, climate change, and the prospect of a disorderly energy transition. *Review of International Studies*, *45*(3), 471-490.

Seto, K. C., Davis, S. J., Mitchell, R. B., Stokes, E. C., Unruh, G., & Ürge-Vorsatz, D. (2016). Carbon lock-in: types, causes, and policy implications. *Annual Review of Environment and Resources*, *41*, 425-452.

Shackley, S., & Thompson, M. (2012). Lost in the mix: will the technologies of carbon dioxide capture and storage provide us with a breathing space as we strive to make the transition from fossil fuels to renewables?. *Climatic Change*, *110*(1-2), 101-121.

Sheehan, K. (2018). This ain't your daddy's greenwashing: an assessment of the american petroleum institute's power past impossible campaign. In M. Rimmer (ed.), Intellectual Property and Clean Energy, pp. 301–321. Springer Nature

Smith, A., Stirling, A., & Berkhout, F. (2005). The governance of sustainable socio-technical transitions. *Research policy*, *34*(10), 1491-1510.

Sovacool, B. K. (2019). The precarious political economy of cobalt: Balancing prosperity, poverty, and brutality in artisanal and industrial mining in the Democratic Republic of the Congo. *The Extractive Industries and Society*, *6*(3), 915-939.

Stegmaier, P. (2023) Conceptual aspects of discontinuation governance: An exploration. In Koretsky, Z. et al. (eds) Technologies in Decline: Socio-Technical Approaches to Discontinuation and Destabilisation. Routledge.

Stegmaier, P. (2023). Conceptual aspects of discontinuation governance: An exploration. In *Technologies in Decline* (pp. 78-116). Routledge.

Stephens JC. (2013) *Carbon capture and storage (CCS) in the USA. Urban F.* Low Carbon Development: Key Issues. London: Earthscan.

Stephens, J. (2009). Technology leader, policy laggard: CCS development for climate mitigation in the US political context. In: Meadowcroft, James, Langhelle, Oluf (Eds.), Caching the Carbon: the Politics and Policy of Carbon Capture and Storage. Edward Elgar, Northampton, MA.

Stephens, J. C. (2006). Growing interest in carbon capture and storage (CCS) for climate change mitigation. *Sustainability: Science, Practice and Policy*, *2*(2), 4-13.

Stephens, J.C., 2006. Growing interest in carbon capture and storage (CCS) for climate change mitigation. Sustainability: Science, Practice and Policy 2 (2), 4–13.

Stephens, J.C., 2006. Growing interest in carbon capture and storage (CCS) for climate change mitigation. Sustainability: Science, Practice and Policy 2 (2), 4–13.

Supran, G., & Oreskes, N. (2021). Rhetoric and frame analysis of ExxonMobil's climate change communications. *One Earth, 4* (5), 696–719. doi:10.1016/j.oneear.2021.04.014

Tansey, R. (2019) Big oil and gas buying influence in Brussels, Corporate Europe Observatory, Food & Water Europe, Friends of the Earth Europe, Greenpeace EU, Brussels.

Tjernshaugen, A. (2008). Political commitment to CO 2 capture and storage: evidence from government RD&D budgets. *Mitigation and Adaptation Strategies for Global Change*, *13*, 1-21.

Trencher, G. (2020). Strategies to accelerate the production and diffusion of fuel cell electric vehicles: Experiences from California. *Energy Reports*, *6*, 2503-2519.

Trencher, G., Rinscheid, A., Rosenbloom, D., & Truong, N. (2022). The rise of phase-out as a critical decarbonisation approach: A systematic review. *Environmental Research Letters*.

Trout K, Muttitt G, Lafleur D, van de Graaf T, Mendelevitch R, Mei L and Meinshausen M 2022 Existing fossil fuel extraction would warm the world beyond 1.5 °C *Environ. Res. Lett.* 17 064010

Trout, K., Muttitt, G., Lafleur, D., Van de Graaf, T., Mendelevitch, R., Mei, L., & Meinshausen, M. (2022). Existing fossil fuel extraction would warm the world beyond 1.5 C. *Environmental Research Letters*, *17*(6), 064010.

Turner, J. M. & Isenberg, A. C. (2018). *The Republican Reversal: Conservatives and the Environment from Nixon to Trump*. Cambridge, MA: MIT Press.

Turnheim, B., & Geels, F. W. (2012). Regime destabilisation as the flipside of energy transitions: Lessons from the history of the British coal industry (1913–1997). *Energy policy*, *50*, 35-49.

UNFCCC (2009) UNFCCC Parties and Observers: http://unfccc.int/parties_and_observers/items/2704.php

Unruh, G. C. (2000). Understanding carbon lock-in. *Energy policy*, *28*(12), 817-830.

Ürge-Vorsatz, D., Rosenzweig, C., Dawson, R. J., Sanchez Rodriguez, R., Bai, X., Barau, A. S., ... & Dhakal, S. (2018). Locking in positive climate responses in cities. *Nature climate change*, *8*(3), 174-177.

Van Alphen, K., Hekkert, M.P., Turkenburg, W.C., (2008). Comparing the development and deployment of carbon capture and storage technologies in Norway, the Netherlands, Australia, Canada and the United States – an innovation system perspective. Presented at the GHGT9 Conference in Washington D.C., US.

Van Dijk, T.A. (2006). Principles of Critical Discourse Analysis. Amsterdam. University of Amsterdam.

Vergragt, P. J., Markusson, N., & Karlsson, H. (2011). Carbon capture and storage, bio-energy with carbon capture and storage, and the escape from the fossil-fuel lock-in. *Global Environmental Change*, *21*(2), 282-292.

Wodak, R & Meyer, M. (2009). Methods of Critical Discourse Analysis. London and New York. Longman.

ZEP (2009) Draft Minutes of The 18th MEETING OF THE ADVISORY COUNCIL, Brussels, 10 March 2009, p.5

ZEP (2023) Zero Emissions Platform https://zeroemissionsplatform.eu