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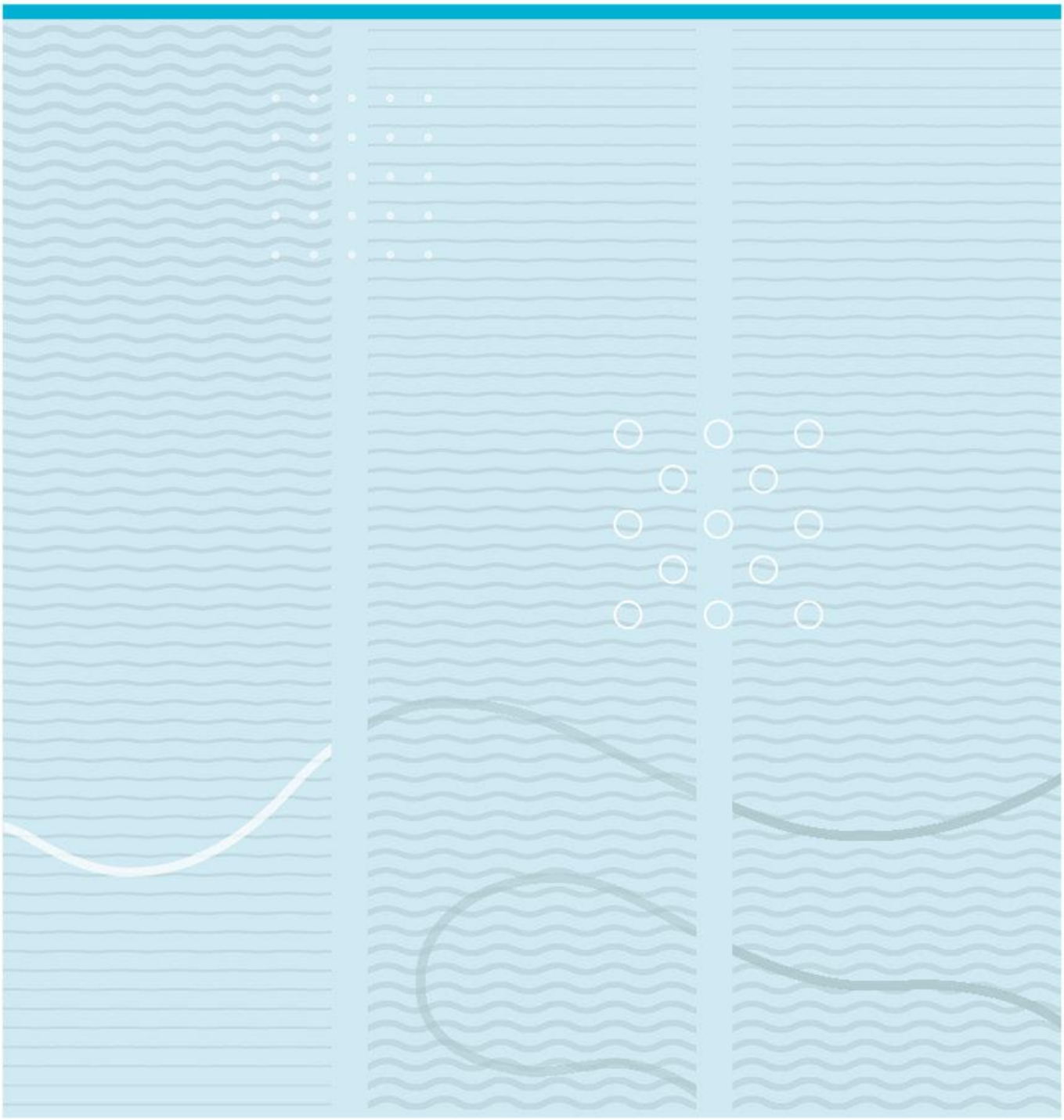
Jesper Backer Lemming

Establishing a Multinational Carbon Removal Certification Framework

A qualitative study on EUs proposal for a carbon removal certification framework (CRCF)



University of South-Eastern Norway
Faculty of Business, Management and Innovation
Institute of Economy, History and Social Science
PO Box 235
NO-3603 Kongsberg, Norway

http://www.usn.no

This thesis is worth 30 study points

Abstract

The main strategy to stabilize global warming to below 2° C is to reduce global emissions; however, an increasing component of the mitigation toolbox is removing carbon from the atmosphere. Currently, the voluntary carbon market actors develop standards, methodologies, and certifications. Stakeholders and policymakers have highlighted this as problematic as there is no universal certification framework behind them. To battle this problem, they are calling for an international certification framework to build a *"quality floor"* in the carbon removal market.

This research aims to analyze and identify patterns in the material from responses to the EUs proposal of a carbon removal certification framework (CRCF) and extract the key findings. The overall research method for this thesis is a qualitative content analysis, the relevant material has been analyzed through a coding frame. The findings show that; The CRCF definition of carbon removal is unclear as it includes emissions reductions. This makes it difficult to know which solutions are eligible. The EU Commission should adopt a more robust definition consistent with the IPCC. Regarding the theme of CRCFs geographical scope, the EU needs to clarify how it will treat carbon removal activities with transboundary value chains and the CRCF can set a global standard as the first of its kind. There are three main positions regarding the use of CRCF in the European Union Emissions Trading System (EU ETS). The first group is requesting an impact assessment to determine if CRCF integration is feasible. The second group strongly supports integrating CRCF into the ETS. The third group is calling for separate targets for carbon removal outside of the ETS.

The research indicates that there are three main insights from actors involved in the carbon removal market who have been giving feedback on the EU's proposed CRCF; The proposal's definition of carbon removal is unclear, which may cause misalignment with the CRCF proposal's main goal. Additionally, the CRCF's geographical range within the EU may be too limited, as it does not consider the transboundary value chains of carbon removal solutions. Finally, there are differing opinions among the CRCF respondents regarding the integration of the ETS, highlighting the need for an impact assessment on this matter.

Keywords: Carbon removal, Negative emissions, CDR EUs CRCF, Climate policy

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Preface

Big thanks to my wife and kids for keeping up with me and giving me time between playing and working on completing this thesis.

Sandane, 15th May. 2023

Jesper Backer Lemming

1.0 Introduction

The main strategy to stabilize global warming to below 2° C is to reduce global emissions; however, a large component of the mitigation toolbox is removing carbon from the atmosphere. Carbon removal *"refers to anthropogenic activities that remove* CO_2 *from the atmosphere and store it durably in geological, terrestrial, or ocean reservoirs, or in products." (IPCC.*, 2018, Global warming of 1,5°, p.24). Nonetheless, there is no international framework for the strategy of removing carbon from the atmosphere. Currently, the voluntary carbon market stakeholders develop standards, methodologies, and certifications. Combined with little transparency, it is hard to compare the quality of the carbon removal, leading to confusion and mistrust of carbon removal solutions (Ares., 2022b). To tackle this, the European Union (EU) has developed a proposal for the world's first multinational carbon removal certification framework (CRCF). This research aims to identify and extract the key takeaways from the feedback given on the EU Commissions' proposed adoption of the CRCF. This chapter introduces the study by first discussing the background and context, followed by the research problem, the research aim and question.

The limited remaining global carbon budget and lack of substantial reductions of Greenhouse Gas Emissions (GHG) to stabilize global warming at well below 2° C amplify the importance of solutions that remove carbon dioxide from the atmosphere (Jackson et al., 2017; G. P. Peters & Geden, 2017). In the Intergovernmental Panel on Climate Change´s Sixth Assessment Report, all the emphasized mitigation pathways likely to limit global warming to 2° C include extensive use of carbon removal at the gigaton scale. All systems must combine deep decarbonizations with carbon removal approaches from natural and technology-based solutions (IPCC, 2022). The recently published synthesis report of the IPCC presents that the estimated amount of carbon removal needed ranges from 5 Gt CO_2 to 16 Gt CO_2 per year by 2050 (IPCC, 2023). Figure. 1 illustrates the ranges of carbon removal needed in the pathways to limit warming to 1,5° or 2° C.

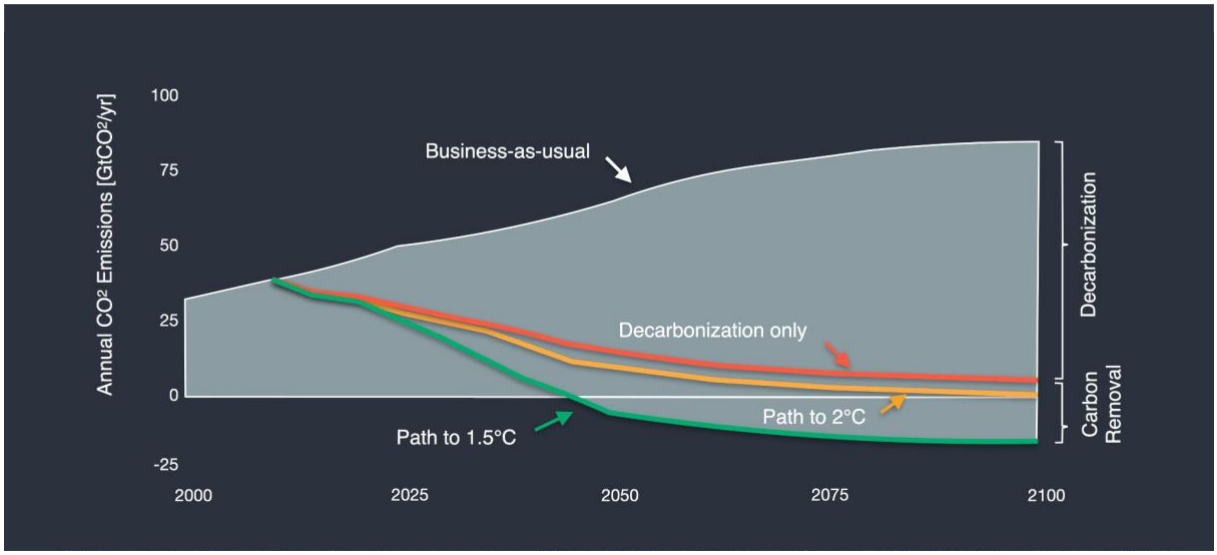

Figure 1:All pathways to stay below 1,5 ° degrees of warming require carbon removal solutions (IPCC, 2018)

The choice of mitigation pathways and climate targets will decide how much carbon removal is needed. Limiting global warming to under 2° C requires severe societal transformations to reduce CO_2 emissions (IPCC, 2022). Arguments against the extensive usage of carbon removal in the scientific community are based on uncertainties such as reliance on geological carbon storage, land use competition, and biodiversity protection. An alternative approach is bridging the mitigation gap by exploring the impact of deeper pathways using an integrated assessment model, including variables such as lifestyle change, and rapid electrification of energy demand based on renewable energy. This approach also has complex obstacles that reduce the amount of carbon removal needed but do not eliminate it (Van Vuuren et al., 2018).

Climate scientist, co-writer of AR6, and research director for the Climate Mitigation group at CICERO, Glen Peters, points out that the cost-effectiveness of the user determines how much carbon will be removed. Arguably, most emissions reductions are low-cost compared to carbon removal and should therefore be deployed first. If emissions are reduced slowly, it means there are still many cost-effective reduction opportunities left to pursue. The faster emissions are reduced, the sooner carbon removal becomes the cheapest mitigation option. According to Peters, carbon removal is part of the mitigation toolbox but is often discussed as if it was outside it (Peters, 2022).

The IPCC (2022) is clear, we will only reach our climate goals and stop global warming with high-quality carbon removal. Regardless of how many gigatons of carbon removal are estimated in the different mitigation pathways, it needs to be reflected by national policies (Minx et al., 2018). Many countries have committed to net-zero targets, and over 120 of them include carbon removal, but few have robust plans or policies for achieving carbon removal at a significant scale (Smith et al., 2023). Today, carbon removal is either being initiated or funded directly by governments or through voluntary carbon markets. Voluntary carbon markets sell carbon certificates or credits consisting of carbon removal, avoided emissions, and emission reduction projects. This thesis will focus purely on the carbon removal part of the voluntary carbon markets. Currently, the voluntary carbon market actors develop standards, methodologies, and certifications (Ares, 2022a).

Stakeholders and policymakers have highlighted this as problematic for three main reasons. First, there is no universal certification framework behind them; it is hard to assess and compare the quality of the carbon removal certificates, leading stakeholders not to trust carbon removal. Secondly, a general need for more transparency and reliable certification processes regarding carbon removal, delivering climate impact not greenwashing (Ares, 2022a). Especially many of the cheaper carbon certificates have been discovered to have little or no climate impact (The Guardian.,2023). Thirdly, carbon removal suppliers meet financial barriers because the carbon removal certificates are being used and labeled in multiple ways. This creates transaction costs for suppliers certifying their carbon removal solution to align with a certification scheme to meet specific purchasing requirements, such as switching costs in changing their operations and providing different requirements and information (SWD, 2022). To build a market with only high-quality carbon removal and delivering carbon removal at the necessary scale, policymakers and stakeholders in the carbon removal space have called for an international certification framework to build a “quality floor” in the carbon removal market, thereby establishing stakeholder's confidence, preventing greenwashing, and facilitating the effective operation of both voluntary and regulatory carbon markets (Carbon Direct, 2023).

In 2021, the EU Commission revealed in its 2022 Work Programme a carbon removal certification framework (CRCF) proposal. The primary goal of the proposal is to accelerate the implementation of high-quality, sustainable carbon removal methods, thereby rebuilding trust and combating greenwashing (Ares, 2022a). As a part of the EU Commissions' adoption

of the CRCF there was a 12-week feedback period on the proposal. The feedback given by respondents consists of unique data material from stakeholders in the carbon removal space. This research aims to analyze the feedback material in order to identify patterns and extract the main insights. To guide this thesis the following research questions are developed:

What are the main insights from actors involved in the carbon removal market who have been giving feedback on the EU's proposed carbon removal certification framework?

In this research, the *actors involved in the carbon removal market* are those who produce, sell, trade, or buy carbon removal. *They can also be involved in the carbon removal market* through consulting, NGO, association, or methodology standard. The *main insight* refers to a noticeable pattern of repeated feedback that can be observed among various participants.

In Chapter one, the context of the study is introduced. The research aims, and questions are identified. In Chapter two, the existing carbon removal literature is reviewed. Then, a summarized review of the EUs first proposal of regulation on a certification framework for carbon removals (CRCF) is presented. Thirdly a qualitative content analysis is done on a segmented part of the feedback regarding the commission's first proposal of regulation on EUs certification framework for carbon removals (CFCR). In Chapter three, the theoretical framework is presented, and the adoption of qualitative content analysis and the broader research design is discussed; including the limitations. In chapter four the findings from the qualitative content analysis is presented.

2.0 Theory

2.1 Concept Definitions

The definition of carbon removal according to IPCC was initially presented in their 2018 report on Global Warming of 1.5° and remained unaltered in their sixth assessment report of 2022: "*CDR refers to anthropogenic activities that remove* CO_2 *from the atmosphere and store it durably in geological, terrestrial, or ocean reservoirs, or in products*" (IPCC, 2018, p. 24). Minx et al. defines negative emissions "as *intentional human efforts to remove* CO_2 *emissions from the atmosphere*" (Minx et al.,2018, p.3). Carbon removal and negative emissions are often used interchangeably. This is because solutions that remove CO_2 from the

atmosphere are referred to as achieving negative emissions. This research emphasizes both definitions and will use *carbon removal* for clarity when referring to solutions that remove CO2 from the atmosphere. It is essential to highlight that we do not include the natural processes of removing carbon from the atmosphere when we talk about carbon removal.

Mixing carbon removal with carbon capture and storage (CCS) is a normal misunderstanding. The IPCC defines CCS as; *"A process in which a relatively pure stream of CO^2 from industrial and energy-related sources is separated (captured), conditioned, compressed and transported to a storage location for long-term isolation from the atmosphere"* (IPCC, 2018, Annex I). Carbon removal removes carbon from the atmosphere, CCS captures some of the carbon coming out of a point source industrial installation. CCS at its best, reduces a company's emissions and is therefore seen as a climate mitigation solution. CCS can play a role in carbon removal if the captured and stored carbon comes from the atmosphere in the first place, for example, using sustainable biomass, meaning that all the emission related to the process is appropriately accounted and calculated into the process.

2.2 The History of Carbon Removal

Research on directly removing CO_2 from the atmosphere has existed for over a century and is as old as the discussion around climate change itself (Arrhenius & Sörlin, 1896). Ideas of removing CO2 from the atmosphere at a large scale to stabilize global warming were part of early considerations for solving climate change (Callendar & Fleming, 1938). The number of proposals grew in the second half of the 20th century, and amongst the more concrete solutions was removing CO_2 by planting trees (Baes et al., 1977, Dyson,1977, Marchetti,1977,1979).

Scenarios that involved large carbon removal deployments and net negative emissions during the second half of the century were first summarized in the IPCC`s Fourth Assessment Report (AR4) (IPCC, 2007), As a result of the attention around the publication of AR4, a growing interest in the climate policy debate to explore mitigation pathways that could keep global warming below 2 degrees. Carbon removal became a part of most integrated assessment models collected for the IPCC`s Fifth Assessment Report (AR5) (Fuss et al., 2014a). In the AR5 period, a broader understanding of alternative long-term mitigation pathways highlighted the availability of carbon removal as an essential key in keeping 2 degrees more ambitious

climate goals within reach (Luderer et al., 2013a; Riahi et al., 2015). BECCS was the first carbon removal solution that was added to all significant integrated assessment models (Blanford., 2013), but AR5 pointed out uncertainties regarding scale, unknown side effects, and availability of BECCS and other carbon removal solutions (Clarke & Jiang, 2014). After AR5, large-scale deployment of carbon removal secured a role in many climate change mitigation discussions (Hallegatte et al., 2016; Hulme, 2016; Luderer et al., 2013b; G. Peters, 2016; Rogelj et al., 2015, 2018; Schleussner et al., 2016).

Scenario evidence around the carbon removal requirements has been the core of the discussion ever since carbon removal came into play at IPCC. Researchers have stressed the importance of carbon removal for reaching climate targets (Fuss et al., 2014b; Monfreda et al., 2015) looked at the limits of carbon sequestration potentials (Field & Mach, 2017; P. Smith et al., 2016a), and questioning the feasibility of integrating carbon removal in climate change mitigation pathways (Anderson, 2016; Geden, n.d.). Obersteiner et al. (2018) have pointed out the existing biases when exploring alternative carbon removal futures. Newer modeling teams have started integrating more extensive portfolios of different carbon removals (Chen & Tavoni, 2013; Marcucci et al., 2017; Strefler et al., 2018). Studies like these indicate a larger share of removal in future mitigation pathways, so the discussion around carbon removals is set to continue. In summary, over the past decade, carbon removal has moved from being minor and uncontroversial to moving toward the center of climate policy discussions (Minx et al., 2018).

2.3. The Carbon Removal Literature

The number of scientific publications around the field of carbon removal has snowballed in the last years as carbon removal has become a more recognized solution to fighting climate change (Minx, Lamb, et al., 2017). The literature is expanding at a faster pace than that of climate change. At the end of 2022 it consists of more than 28 000 studies written in English (S. Smith et al., 2023). The knowledge about carbon removal is still relatively diffuse and incomplete (Fuss et al., 2016; P. Smith et al., 2016b). Literature review methods are not so common, despite the importance of knowledge synthesis and policy-relevant assessment (Minx, Callaghan, et al., 2017; Petticrew & McCartney, 2011; Petticrew & Roberts, 2008; Ringquist, 2013).

Fortunately, in 2018 three highly cited articles assessing the academic literature on carbon removal were written by 19 authors from 6 countries, synthesizing the most important findings from qualitative and quantitative literature. "Negative emissions – Part 1: Research landscape synthesis" (Minx et al., 2018), "Negative Emissions – Part 2: Cost, potentials and side effects" (Fuss et al., 2018), and "Negative Emissions – Part 3: Innovation and upscaling" (Nemet et al., 2018). This is a series of articles comprehensively and systematically assessing the body of publications on carbon removal up to 2018, existing of more than 2000 studies (Minx, Lamb, et al., 2017).

The advancements in science and innovation have led to a rise in the number of carbon removal solutions available on a small scale. Today there are seven well-known and established carbon removal: Afforestation & reforestation (AR), Soil carbon sequestration (SOC), biochar (BC), Bioenergy with carbon capture & storage (BECCS), Direct air capture (DAC), Enhanced weathering & ocean alkalinization (EW) and Ocean fertilization (OF) (Minx et al.,2018, p. 3). The figure below gives an overview of different carbon removal solutions, ranging from more low-tech solutions such as planting more trees through Afforestation, to more high-tech options as developing machines scrubbing the CO_2 from the air with direct air capture transforming the CO_2 to liquid and storing it in geological formations. Note that the solutions are categorized a bit differently than Minx et al (2018).

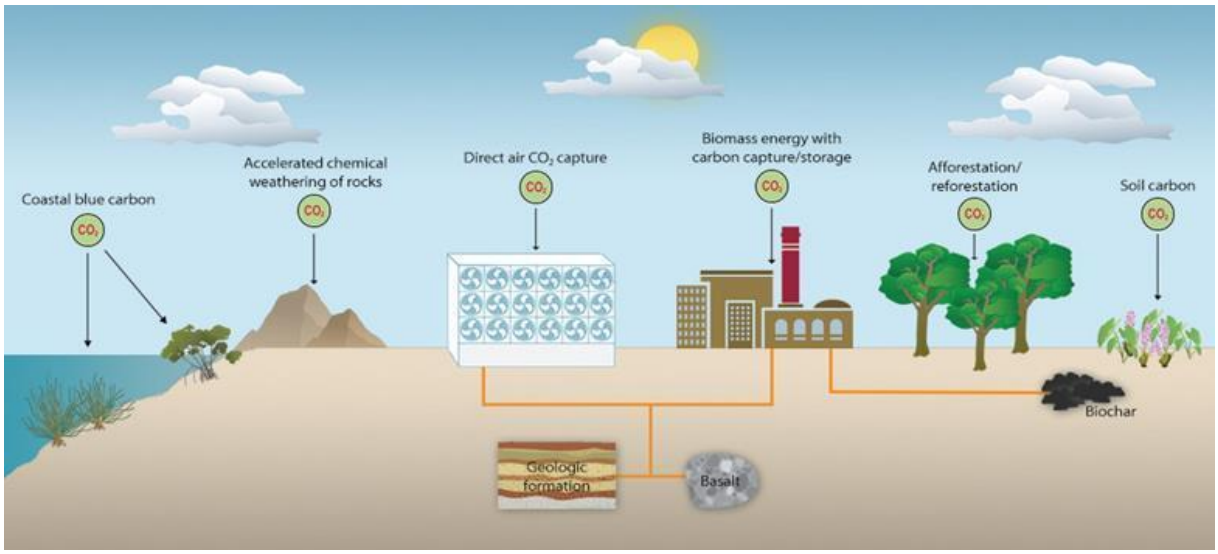

Figure 2: A simplified overview of carbon removal solutions from the National Academy of Science in 2018 (Pacala, 2023).

2.3.1 Cost, Potentials, and Side Effects

To achieve the scale of carbon removals needed, it is essential to take into account three significant factors emphasized by Fuss et al (2018). These factors include the biophysical potential for carbon sequestration including storage and permanence, the economic costs, and the social, economic and environmental impacts of their deployment. Existing assessments suggest that carbon removals range widely along these dimensions (National Academy, 2015; Royal Society, 2009) and that large-scale deployment will indeed have non-trivial impacts on water use, land footprints, and nutrient use (P. Smith et al., 2016b).

The scaling and development potential also depend on the ability to deploy portfolios of carbon removals consisting of different solutions rather than single solutions (Fuss et al., 2018). At the same time, the deployment scale of the individual solutions is complex to add up because as they scale, some solutions will compete with another for resources, e.g., land when it comes to afforestation, reforestation and BECCS. Costs vary significantly between different research contributions, e.g. Biochar varies between 11 - 600 USD per ton of carbon (Höglund & Niparko, 2022). Despite the technology cost reductions from learning, the marginal cost of abatement tend to increase with deployment due to opportunity costs for land and soil carbon management, which impose further limits when deploying carbon removal solutions. Summing up potential and cost considerations of a natural order of phasing in the different carbon removals should be considered (Fuss et al., 2018). An aspect often neglected in carbon removals is the co-benefits they may yield. Literature shows evidence that afforestation, soil carbon management, enhanced weathering, and biochar may contribute to nutrient retention and soil quality when managed properly (Minx et al., 2017).

The knowledge gaps highlighted by Fuss et al (2018), are further work on individual carbon removal solutions that estimate actual deployment's economic costs and benefits; continuing a quantification of environmental, economic, and social externalities regarding deployment. This will also give positive contributions to more comprehensive modeling. There is also a need to understand better the different barriers to implementing carbon removal solutions and how to tackle them. This involves research on policies, incentive schemes and finance, public opinion, governance, and real-life demonstration projects (Fuss et al., 2018).

2.3.2 Innovation and Upscaling

Results from integrated assessment models show that carbon removals play a key role in the second half of the 21st century for below 2 C° scenarios. The major period of new carbon removals deployment is between 2030 and 2050. The broader innovation literature on carbon removals finds that scaling and deploying these novel technologies takes decades. Researchers finds a gap between the amount of carbon removal that countries are intending to carry out and what is required to achieve the temperature goals outlined in the Paris Agreement. There is also few existing plans by countries to scale carbon removal beyond current levels, revealing a significant shortfall (S. Smith et al., 2023), considering the millions of actors needing to adopt this technology to achieve planetary scale (Nemet et al., 2018). Nemet et al.`s assessment of the carbon removal literature on innovation and scale shows increased literature across all carbon removal solutions. The literature on emerging mitigation technologies supports the diversification to manage risk (Anadón et al., 2017). Taking into account that most of the carbon removals are in an early phase, a similar approach makes sense. The heterogeneity of these technologies regarding limitations and adverse side effects bears the stamp of a portfolio-based risk management approach to scaling up carbon removals, contrary to a singular focus (Nemet et al., 2018).

The language most used in the carbon removals literature often has a supply-side focus on deploying carbon removals instead of adopting, which is more accurate regarding all the stakeholders that need to be aligned for carbon removal to scale. A focus on “deploying” carbon removals ignores the preferences and attitudes of key actors as well as the communities in which they operate. Biochar, for instance, would involve the activities of millions of farmers. Managing policy risks and understanding public concerns are crucial elements of the technology adoption process. These are crucial topics which are only marginally addressed in the literature (Nemet et al., 2018).

2.4 Scope and Research Gap

Peters & Geden (2017b), stress the political implications of large-scale carbon removal and the challenges of translating the need for carbon removal into policies that incentives businesses to research, develop, and deploy required solutions. They also highlight the potential conflicts that may arise between countries with regarding the implementation of

carbon removal solutions, especially in terms of differentiation and burden sharing (Peters & Geden, 2017b).

According to Tamme & Beck (2021), there are three key reasons to why a policy is necessary to deploy carbon removal solutions at scale. Firstly, since little progress has been made towards reducing emissions, the likelihood of needing carbon removal has increased. Secondly, historically technological innovation has shown that it will take decades to make technology-based carbon removal available at scale. Thirdly, due to increased climate ambition in the near term, carbon removal will need to be scaled up sooner. Developing a carbon removal policy today would reinforce the EU´s position as a climate leader and it will set the groundwork to enable early investment in technological carbon removal solutions, thereby progressing commercialization, and reducing the cost of these technologies to support global access to carbon removal in the long term.

IPCC Synthesis Report (2023) underlines that all carbon removal approaches have their advantages and drawbacks. Thus, a careful comprehension of the benefits, cost and risk for understanding each carbon removal solution is necessary for responsible research, development, and implementation alongside existing natural solutions (Boehm & Schumer, 2023).

As carbon removal plays an important role on the EU's path to a net-zero society, the question being more heavily debated is how? How do we ensure scaling carbon removal to gigatons scale by mid-century? NGOs, the private sector, and policymakers are now discussing how to encourage carbon removal scale-up. Nemet et al. (2018) highlight that if carbon removal is to be deployed at the levels required to meet 1,5 – 2 degrees targets, then it is crucial to address several post-R&D issues in the literature. These issues include incentives for early deployment, niche markets, scale-up, managing policy risks, and public acceptance if we wish to accelerate the deployment process.

To successfully implement carbon removal solutions, Tamme & Beck (2021) point out that policymakers must address two gaps: commercialization and accounting. Currently, EU policy only supports a limited number of demonstration projects, which creates a commercialization gap between these projects and the large-scale development of solutions that can be implemented by climate policy, such as the EU Emission Trading System. To

bridge this gap, policies must facilitate cost reductions, develop CO2 transport and storage infrastructure, provide access to affordable financing, and compress deployment timelines. These measures would enable the widespread deployment of carbon removal solutions. The accounting gap is also crucial to address as it is essential to demonstrate that actual carbon removal is being delivered. Incentive mechanisms can only be designed for quantifiable carbon removal approaches. Therefore, addressing this gap is critical to ensure that policymakers can design effective incentive mechanisms. Tamme & Beck (2021), conclude that the EU provides a promising comprehensive climate policy framework; however, more must be done to ensure accurate accounting and that the technologies are commercialized in time to deliver on climate ambition.

2.5 EUs Proposal for a Carbon Removal Certification Framework

2.5.1 Political Context and Problem that the Initiative Aims to Tackle

The European Climate Law requires the EU to deploy solutions for capturing and storing CO2 to achieve climate neutrality by 2050. Both natural and industrial carbon removal solutions are required to remove several hundred million tonnes of CO2 from the atmosphere yearly. However, the EU is not on track to deliver these quantities. The lack of a common EU standard for identifying sustainable carbon removal solutions is a major barrier to upscaling. Existing public and private programs, such as voluntary carbon markets, use different methods to certify and measure the climate effect. Certifying carbon removals is challenging due to technical obstacles such as the risk of uncontrolled re-emission, measuring, and monitoring difficulties: particularly solutions that sequester carbon in natural ecosystems such as the ocean, where research is scarce. Carbon removal may have trade-offs and synergies with biodiversity and other sustainability goals. Different solutions and standards may need to be developed for scaling different removals due to their different characteristics and nature (Ares, 2022a).

2.5.2 Basis for Action

The initiative is based on EU Articles 191 and 192 of the Treaty on the Functioning of the European Union, which empower the EU to safeguard the environment and human health (Ares, 2022a). Climate change is a cross-border issue that requires coordinated EU action to supplement and reinforce national and local efforts. To implement carbon removal on a large

scale, a common EU standard is necessary to ensure consistent certification rules and methodologies are applied throughout the EU. This coordination at the European level strengthens climate action and EU action is justified by the principle of subsidiarity outlined in Article 191 of the Treaty on the Functioning of the European Union (Ares, 2022a).

2.5.3 Objectives and Policy Options

Establishing a certification framework for carbon removals is a crucial step towards achieving the EUś climate-neutrality objective by making a net contribution from carbon removals. This framework should identify types of carbon removal to consider and set robust requirements for quality of measurement, monitoring, reporting, and verification. It should also ensure environmental integrity, especially with regard to the EU`s aim to reverse biodiversity loss and pollution. Be credible and socially acceptable to gain the trust of stakeholders and social society. A reliable certification framework will enable financial incentives that promote additional removals in the EU, contribute to climate neutrality, and promote environmental integrity. To ramp up the development of high-quality carbon removals over the next few years, the certification framework should enable more funding from private and public sources. This could be through voluntary carbon markets, private purchasing or investment initiatives, or public funding programs. In the existing baseline scenario, actors in the voluntary carbon markets continue to set their own standards (Ares, 2022a).

The initiative will assess whether to establish a general EU certification framework that sets minimum standards for certification methodologies, including monitoring, reporting, and verification. Alternatively, it may provide comprehensive regulations for certifying each type of carbon removal. Additionally, it will determine whether private operators or public authorities should perform various functions, such as prior project validation and verification of carbon removal achieved, possibly within a centralized EU system (Ares, 2022a).

2.5.4 Likely Impacts

The contribution of carbon removal to climate change mitigation is expecteded to have a generally positive impact on the environment (Ares, 2022a). When nature-based carbon removal is founded in ecological principles, they have the potential to preserve biodiversity, aid climate adaptation, and provide other ecosystem services such as air and water purification (Ares, 2022a). Additionally, removing carbon from the atmosphere based on

carbon removal certificates can be scaled up as a business model, which can have positive economic and social impacts on land managers in rural areas by helping them sustain their livelihoods. Industrial companies can also benefit from increased opportunities and be rewarded for producing high-quality carbon removals, thereby gaining environmental integrity. The EU highlights that this initiative will have positive contributions to Sustainable Development Goals 13 (Climate Change) and 15 (Life on Land) (Ares, 2022a).

2.5.5 Impact assessment & consultation strategy

The impact assessment related to this initiative will evaluate the economic, social and environmental effects of different options for certifying carbon removals; with a particular emphasis on the quantity and quality of carbon removals that can be achieved at scale.
The consultation strategy by the Commission consists of the following: An expert survey conducted during Q3 2021 to develop a mechanism for certifying carbon removals. Secondly, an online conference, thirdly, 12 weeks open consultation feedback period on the impact assessment, and lastly, reviewing stakeholder documents like policy briefs, position papers, or roadmaps. The outcomes of the consultation will be used to shape the Impact Assessment that accompanies the Commission proposal for this initiative (Ares, 2022a)

The identified stakeholders include entities delivering carbon removals, such as land managers, farmers, foresters, and industrial companies involved in capturing and storing carbon. Also, potential purchasers of carbon removals include companies in the food processing and digital technology sectors, public administrators in member states, and the scientific community. Additionally, stakeholders involved in existing voluntary carbon removal markets, such as certification bodies or financial agents traditionally supporting the land sector, are also identified (Ares, 2022a).

Between 07 February and 02 of May (2022), the commission held a public consultation with the aim of collecting opinions that would inform the impact assessment of the corresponding proposal. Participants were able to respond to a set of 11 multiple-choice questions and also had the chance to provide final remarks and upload position papers. A total of 396 responses were received with the majority od respondents being companies (38%) followed by business associations (20%). Responses were submitted by participants from 30 different countries. The largest number of respondents by countries was Germany (20%), followed by Belgium (17%) and France (11%) (Ares, 2022b).

2.5.6 Proposal of regulation from the European Commission

The IPCC has emphasized that to achieve the 2050 climate neutrality goal set out in the European Climate Law, increasing amounts of CO2 will need to be captured and removed from the atmosphere annually through carbon farming and industrial solutions to remove several hundred million tonnes of carbon per year. The Commission's Sustainable Carbon Cycles Communication stresses the importance of creating a business model that rewards land managers for carbon sequestration in full compliance with ecological principles as carbon farming. Also, using innovative technologies, establishing an EU internal market for capturing, storing, and transporting industrial carbon. In this context, the current initiative proposes a regulatory framework for certifying carbon removals. A large majority (89%) of stakeholders who responded to the public consultation agreed that *"establishing a robust and credible certification system for carbon removals is the first essential stepping stone towards achieving a net contribution from carbon removals in line with the EU climate-neutrality objective"* (SWD, 2022, p.1). This impact assessment report evaluates the policy options for such an EU certification framework to address three main issues that affect the future development of carbon removals (SWD, 2022).

The first issue is the difficulty in assessing and comparing the quality of carbon removals, this creates substantial search costs for potential investors interested in carbon removal and it presents a classic market failure, which poses a risk of directing financial backing to carbon removal activities that may not be dependable as effective mitigation measures. To tackle this issue, this initiative seeks to ensure the quality of all EU-certified carbon removals by utilizing certification methodologies that are customized to the individual circumstances of each carbon removal solution. The Commission's proposals include establishing an EU quality standard for carbon removal certification along four quality criteria, referred to as **QU.A.L.ITY**: **Qu**antification, **A**ddisjonality and baselines, **L**ong term storage and sustainabil**ITY**.

The proposed regulation incorporates the best practices for each of these criteria, considering pertinent legislation while acknowledging that the fundamental elements needed to address the QU.A.L.ITY criteria will differ among various carbon removal solutions. The second step is therefore to develop accurate certification methodologies to implement the QU.A.L.ITY

criteria in the different types of carbon removal solutions. For example, the regulation will acknowledge the robust assurances for the permanence of carbon storage in geological formations while also outlining the minimum sustainability requirements for carbon farming solutions. This Impact Assessment compares two quality options with regarding carbon removal certification. The first option (option Q1) involves certification schemes developing methodologies that align with the EU QU.A.L.ITY criteria and submitting them to the responsible public authority for recognition. The second option (option Q2) involves the Comission developing the methodologies in close consultation with an expert group. This Impact Assessment analysis concludes that option Q2 holds the greatest potential for ensuring the quality of carbon removal certificates and enhancing their comparability while also minimizing the administrative costs associated with developing or approving methodologies for certification schemes (COM, 2022).

The second issue is that several stakeholders lack trust in carbon removal certificates because they can be produced through unreliable certification procedures that certify activities without delivering actual climate and sustainability benefits. To address this problem, certification schemes must establish clear and strong regulations and procedures to reduce the risk of certifying low-quality removals, ensure that carbon removal projects deliver as planned, prevent duplicate certification of the same project, and avoid reuse of the same certificate. *The third issue* is that providers of carbon removal face barriers in accessing finance. This is due to the wide range of ways to use carbon removal certificates, such as voluntary carbon markets, public funding, inclusion in sustainability reports and contractual arrangements, and voluntary labels. This diversity creates transaction costs regarding search and switching for those seeking certification of their carbon removal activity. Search costs being the time and effort spent understanding the quality of the certification procedures of a given scheme. Switching cost is the cost of attempting to raise other complementary or alternative types of funding, which is likely to require changing their operations and providing a different set of evidence and information (SWD, 2022).

Certification schemes must adhere to three transparency requirements to address the second and third issues. These include reliable and transparent procedures for scheme management, such as internal management and monitoring, handling complaints, and appeals, consulting stakeholders, and publishing information. Equally important is independent verification by third-party auditors to ensure compliance with the QU.A.L.ITY criteria for carbon removal

and full disclosure of all information related to certified carbon removal that should be publicly available and traceable through registries. A process has been established to recognize certification schemes to comply with these transparency criteria. Only recognized certification schemes can be used by providers of carbon removal to demonstrate compliance with the QU.A.L.ITY criteria and the relevant certification methodologies (COM, 2022).

The Impact Assessment done by the EU Commission expert group compares two governance options for recognizing certification schemes; Option G1, where member states are responsible for the recognition, and Option G2, where the Commission takes on this responsibility. According to the impact assessment, option G2 performs better, ensuring a strong and unified certification process and promoting the internal carbon removal certification market. At the same time, minimizing administrative costs for public authorities. In conclusion, the most favorable policy option is one in which the Commission collaborates with experts and stakeholders to create certification methodologies and standardizes the implementation of the certification framework and the QU.A.L.ITY criteria through recognized certification schemes (COM, 2022).

For the purpose of this Regulation, the European Commission has applied its own definitions of carbon removal *"Carbon removal means either the storage of atmospheric or biogenic carbon within geological carbon pools, biogenic carbon pools, long-lasting products and materials, and the marine environment, or the reduction of carbon released from a biogenic carbon pool to the atmosphere".* There is also developed a definition of carbon removal activity *"Carbon removal activity means one or more practices or processes carried out by an operator resulting in permanent carbon storage, enhancing carbon capture in a biogenic carbon pool, reducing the release of carbon from a biogenic carbon pool to the atmosphere, or storing atmospheric or biogenic carbon in long-lasting products or materials"* (SWDb, 2022, p.10).

3.0 Methodology

3.1 Research Strategy and Design

The overall research method for this thesis is a qualitative content analysis based on the following definition: "*Qualitative content analysis is a method for systematically describing the meaning of qualitative data"* (Mayring., 2000; Schreier.,2012). This is done by assigning successive material areas into categories resulting in a coding frame. Three features can characterize the method: qualitative content analysis reduces data, it is systematic, and it is flexible (Schreier., 2014). The coding frame is essential to the method and can have varying levels of complexity. In qualitative research, it's usually an iterative process where the same steps are repeated, and the coding frame is modified along the way (Schreier, 2014).

3.1.1 Selecting Material

Qualitative content analysis is known for its highly systematic approach. To begin, the method entails thoroughly examining all relevant material in relation to the research question. This method helps to prevent the risk of viewing the material solely through the lens of one's assumptions and expectations. In this case, the original material consists of 210 responses that the EU Commission has divided into the following classifications; business association, company, NGO, EU-citizen, Academic institution, environmental institution, trade union, public authority and other. In this research, relevant material are the actors involved in the carbon removal market meaning those who produce, sell, trade, or buy carbon removal. They can also be involved in the carbon removal market through consulting or as an NGO, association, or methodology standard.

To find relevant material for my research question, I needed to review all of the feedback material. This involved reviewing all 210 responses posted on EU website for a brief overview. By scrolling through the feedback preview, which includes the introduction and grouping of each current feedback, it was pretty straightforward to determine if they are relevant data material. i.e. whether or not they are involved in the carbon removal market. This resulted in 82 responses that I excluded from this research on initial examination. Of the remaining 128 responses, I uploaded them into a program called *mendeley reference manager*, where I could filter them as relevant to this study or not based on the research question. Although the criteria for determining relevance may seem clear, I found that researching each respondent individually, if not certain, provided enough insight into their

relevance for this study. In the end, I ended up with 23 relevant responses material for this research; 7 NGOs, 3 traders, 4 suppliers, 3 advisors, 2 buyers, 2 methodology standards, and 2 associations.

3.2 Building a Coding Frame

The coding frame is the heart of the method and consists of at least one main category and subcategories. The main category is those aspects of the material about which the researcher would like more information. The subcategories specify what is said in the material with respect to the main category. Qualitative research often involves large amounts of material, therefore and to avoid "cognitive overload," the material used to build the frame is limited to a segmented part of the actual material. Therefore the first step in building a frame was to select a segmented part of the relevant material. The key criterion is selecting the material to reflect the full diversity of the data sources to ensure that the coding frame is matched to the material (Schreier., 2012).

3.2.1 Structuring and Generating

Structuring and generating are the next steps in building the coding frame. Structuring refers to creating main categories and generating subcategories for each main category. There are two ways to ways to go through with this, it can be done in a data-driven- or a concept-driven way. Schreier (2012) points out that a key objective of qualitative content analysis is to provide a good description of the material. Concept-driven categories alone may leave part of this material unaccounted for. For this reason, concept-driven categories are often combined with data-driven categories. An approach to this is to create main categories in a concept-driven way and to add subcategories in a data-driven way. Working in a concept-driven way means basing the categories on previous knowledge, a theory or prior research.

Starting out, I was sure I could find the main categories in a concept-driven way by looking through the documents generated by the EU Commission so far on establishing a carbon removal certification framework. These documents highlight three main issues that the proposal aims to tackle: *assessing and comparing quality, lack of trust, and producers' barriers to finance.*

I initiated the process of adding the subcategories in a data-driven way through subsumption. Subsumption is a good strategy for developing subcategories in a data-driven way after the main categories have been created (Schreier., 2012). It involves examining one passage of the selected material after another, going through the following steps: start reading the material until a relevant concept is found, if this concept does not have a covering subcategory, create a new subcategory. Then continue like this until all relevant concepts are encountered. Reading the selected feedback material to create the subcategories in a data-driven way I realized that the concept-driven main categories might not work. It became more and more clear as I got deeper into the material that the feedback did not necessarily respond to the three main issues that the carbon removal certification framework highlighted as key to solving. Every respondent naturally has their agenda and point of interest. It became clear that I had to use a data-driven way both for generating main categories and subcategories.

Then I started reading the selected feedback material until no new concepts could be found, reaching what Schreier (2012), describes as a point of saturation. Schreier (2012), highlights that when the entire coding frame is generated through a data drive approach's the strategy of successive summarizing is key. *"This involves paraphrasing relevant passages, deleting from these passages anything that appears superfluous, and summarizing similar paraphrases, which are then turned into categories and subcategories"* (Schreier, 2012, p.176).
I solved this by reading the material and summarizing relevant findings based on the research question into short sentences. Then I wrote all the sentences on a whiteboard and started looking for patterns, paraphrasing them into main categories and subcategories. The main categories I ended up with were *defining carbon removals, geographical scope,* and *EU Emission Trading system (ETS).* After carefully reviewing the material in a data-driven manner, it became evident that the first two primary categories are sufficiently narrow and do not require any subcategories. Adding subcategories could potentially exclude relevant information. The last main category EU ETS the following subcategories were created: *Inside ETS, Outside ETS,* and *Impact assessment needed.*

After the structure of the coding frame is made, the different categories need to be defined. The categories should contain these elements: a category name, a description of what that name means, indicators, and decision rules. (Schreier, 2012, p.176) In this research decision rules were not needed, this can be applied to multiple subcategories if needed to make sure that they are mutually exclusive. With the mutually exclusive subcategories used in this

research, there was no need for decision rules. The text matrices below give an overview of the coding frame generated for this research with the main categories, sub-categories descriptions, and indicators. Once all categories have been generated and defined, it is necessary to step back, review the coding frame again, and if there are remaining loose ends these need to be addressed (Schreier, 2012, p.177).

The coding frame

Main category 1: Defining carbon removal
Description: Feedback on how EUs proposal for a Carbon removal certification framework (CRCF) defines removals
Indicators: CRCF definition, defining carbon removal

Main category 2: Geographical scope
Description: Feedback on the Geographical scope of EUs proposal to a CRCF
Indicators: Boundaries, scope, cross boarder regulation

Main category 3: EU Emission Trading System (ETS)
Description: The CRCF in the context of the EU ETS
Indicators: Alignment, integrated, under, isolated
Subcategory 1: Inside ETS
Subcategory 2: Outside ETS
Subcategory 3: Impact assessment needed

3.2.2 Segmentation & the Pilot Phase

In qualitative content analysis, it is important to consistently categorize all material. To ensure this, two rounds of coding are carried out and then compared. This only makes sense if the codes are applied to identical parts of the material each time. Therefore, the material must be segmented into units before coding. The material in this study has been segmented into the following units: Carbon removal; supplier, buyer, trader, consultant, NGO, association, and methodology standard. Segmentation involves dividing the material into units to fit into the coding frame's categories. When conducting qualitative research, it is often more effective to use a thematic approach and identify topic changes. Thematic units may not have clear boundaries for where a theme begins and ends, but they can provide a more precise match with the coding framework (Schreier, 2012). In this research, where we are looking for key insights applying a thematic approach made sense and matched the created coding framework well.

During the pilot phase, a small portion of the material is used to test the coding frame. It's important to select pilot material that covers all types of data to identify and address any issues with the frame before conducting the main analysis. To develop the frame, 2 responses from each of the units from the relevant material were selected. The categories from the coding frame were applied to the material during two rounds of coding, the same procedure that will be used during the main coding. (Schreier, 2012).

3.2.3 The Main Analysis

During the main analysis phase, all the material is coded. It's crucial to note that the coding frame cannot be changed at this point. To begin the main analysis, the remaining material not used in the pilot phase must first be divided into units. Afterward, the material is coded by assigning these units to the categories in the coding frame. During the final stage of the primary analysis, it is necessary to organize the coding results in a way that enables them to provide answers to the research question (Schreier, 2012, p.180). In this research the coding frame was done through an excel sheet. The sheet became quite large, consisting of a lot of data text, therefore it made a lot of sense to extract the key insights fit to answer the research question and put them into text matrices more fitting for a presenting format. The advantages of doing this is that the readers are given text matrices were the material are scoped down to fit the exact research question. Reflections done by the researcher and something to bear in mind is that by doing this, the research are excluding the raw data who might be to much for the reader and give what Schreier (2012, p175) refers to as *"cognitive overload"* but the raw data is richer and gives a broader contexts. To compensate for this the findings will also be presented with quates from the raw data in the excel sheet coding frame.

4.0 Findings

This chapter will present the findings from the qualitative data analysis. In this research, the findings from each individual category of the coding frame will be presented trough text matrices and quotes in continuous text. Then a total overview of the key findings will be given at the end.

4.1 How the CRCF defines carbon removal

Table 1 summarizes the findings from the first main category looking at the feedback on the EU Commission's definition of carbon removal in the CRCF.

Table 1.

Defining carbon removal	*Description:* How CRCF Defines Removals *Indicators:* CRCF definition, defining carbon removal
Supplier	
Hafslund Oslo Celsio	"Unclear definition, making it unclear which solutions are eligible"
Carbon Engineering	"Carbon removal differentiated from carbon offsets based on avoidance"
Stockholm Exergi	"Emission reduction must not and will not be regarded as negative emission"
Buyer	
Microsoft	"Differentiating carbon removals from carbon reductions"
NGO	
Zero Emission Platform	"We call for a more robust and thorough definition"
Bellona	"The CRCF must only certify real removals"
Carbon Gap	"Excluding emission reductions from the definitions"
Carbon Market watch	"Emission reductions should be excluded from the definition"
Clean Air Task force, CITO, ecos, epico, Energi policy group, Transport	"The EU should adopt a clear definition of carbon removal, consistent with IPCC"
Association	
Carbon Capture and Storage Assosiation	"We call for a more robust and thorough definition of carbon removals"

10 out of 23 had specific comments regarding the definition, Microsoft, currently one of the biggest buyers of carbon removal clearly stated *" Driving clear definitions by differentiating carbon removals from carbon reductions"* and "*If the EU CRCF allows for both removals and reduction, it is crucial that credits be delineated and labeled clearly according to which category they fall under"*(Microsoft, 2023) All of the feedbacks highlight that emission reduction should be excluded from the definition as Carbon Gap clearly states it " *In its latest report, the Intergovernmental Panel on Climate Change (IPCC) defined carbon removals as" "anthropogenic activities removing carbon dioxide (CO2) from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products".*

"Emission reductions from biogenic carbon pools, as included in the proposal's definition of carbon removals, do not meet the IPCC's definition and consequently should not be included in this proposal's definition"(Carbon Gap, 2023). Seven out of nine clearly suggest that carbon reduction can not be a part of the definition. Two out of nine are calling for "a more robust and thorough definition of carbon removals" (CCSA, 2023)

Summarized the definition of carbon removal in the CRCF is unclear because it includes emissions reductions as part of the definition. Not clearly differentiating carbon removals from carbon reductions makes it difficult to know which solutions are eligible and which are not. The EU Commission should adopt a more robust and thorough definition consistent with the IPCC.

4.2 The Geographical scope of CRCF

The second main category summarized in the text matrix below is *Geographical scope*. Of the twenty-three relevant feedbacks, ten of them have objections regarding the proposed geographical scope by the EU Commission on the CRCF.

Table 2.

EU Geographical scope	*Description:* Feedback on the Geographical scope of CRCF proposal *Indicators:* Boundaries, scope, cross boarder regulation, outside EU
Suppliers	
Carbon Engineering	"Countries outside EU should be able to adopt the CRCF"
Hafslund Oslo Celsio	"The EU needs to establish rules for the sales of carbon removal certificates both within the EU and Globally"
Drax	"Extending the scope of the proposed framework"
Trader	
Carbonfuture	"Promote the harmonization of carbon removal beyond EU borders"
Methodology standard	
Puro	"Geographic scope should be global"
Consultant	
Carbon direct	The EU certification system can, when well developed, act as a catalyst toward global convergence and increased trust.
NGO	
Zero Emission platform	"Regulation should clarify how carbon removal activities with trans-boundary value chains will be treated"
Negative emissions platform	" We encourage efferts towards harmonization and implementation beyond European Union"
Carbon Gap	The scope does not consider that parts of the supply chain, may be most effective outside the European union
Bioenergy Europe	"The EU should advance the harmonisation of removal certifications beyond European borders to ensure a wide recognition"
Association	
Carbon Capture and storage association	"the EU has the opportunity to set a global standard"

The feedback emphasizes uncertainties regarding the boundaries of the CRCF, the bioenergy company Drax highlights *"The scope of this certification proposal is currently limited to removals within the EU. It is unclear how removals outside of the EU and certificates issued outside of the EU will be treated."*(Drax, 2023). The findings can be summed up in two main takeaways. Firstly parts of the existing supply chain for many carbon solutions are outside the EU; therefore the Comission *"should clarify how carbon removal activities with transboundary value chains will be treated"* (Zero Emissions Platform, 2023). Secondly, as the CRCF is the first of its kind and *"the EU has the potential to set a global standard"* (CCSA, 2023) *so "The EU should advance the harmonization of removal certifications beyond European borders to ensure a wide recognition"* (Bioenergy Europe, 2023).

4.3 The CRCF in relation to EU ETS

The third main category was looking at the CRCF considering EU's Emission trading system (ETS). Twelve of twenty-three feedbacks had clear and divided opinions about this theme. The feedback is categorized in Table 3 below by the subcategories created in the coding frame; *inside ETS*, *outside ETS*, or *impact assessment needed*

Table 3.

CRCF and EU ETS	*SUB 1: Inside ETS*	*SUB 2: Outside ETS*	*SUB 3: Impact assessment needed*
Supplier			
Carbon Engineering			Investigate how carbon removal could be integrated into EUs Carbon market
Hafslund Olso Celsio		Separate target for removals in a pillar of its own outside EU ETS	
Stockholm Exergi		Separate target for removals in a pillar of its own outside EU ETS	
Drax	Integration with ETS considered in the longer run		
Methodology Standard			
Puro	We believe that carbon removal can contribute to corporate claims under the EU ETS		
CR Buyers			
Airbus	Consider as the next step the extension of EU ETS to carbon removals		

Consultant			
DNV	Stress the importance of ensuring alignment and study the impact of integrating CDR with the EU ETS		
Cebola Partners	Consistency between CRCF and EU ETS		
NGO			
Zero emissions Platform			Investigate and provide guidance for how carbon removal could be integrated under the EU ETS
Carbon market watch		No removals certified under the CRCF should be used under the EU ETS	
Bellona		The ETS can support emission reductions and other non-removal activities	
Association			
Bioenergi Europe			The potential future linkages of CRCF and EU ETS needs to be more clarified

According to the findings, there are three main positions related to the CRCF within the EU ETS context. However, there is no clear pattern as to whether they are suppliers, NGOs, or buyers. Three of the actors call for an impact assessment, one of the suppliers expresses the need to "Investigate how carbon removal could be integrated into EUs Carbon market"(Carbon Engineering, 2023, p. 2) and the association Bioenergy Europe (2023, p. 3) emphasizes that "the potential future linkages of CRCF and EU ETS needs to be more clarified". Five of the feedbacks advocate that carbon removal should be integrated into the EU ETS in some form. The airline company Airbus (2023, p. 1) points out that "the integration of carbon removals into EU ETS will be key to support the emergence and development of this market for aviation, therefore Airbus encourages the EU Commission to already consider as the next step the extension of the EU ETS to carbon removals"

The methodology provider and trader Puro "believe that carbon removal can contribute to corporate claims under the EU ETS"(Puro Earth, 2023, p. 1) In the sub-category of respondents who believe that the CRCF should stay outside of the ETS we find the NGOs Bellona (2023, p. 4) who states that "The ETS can support emission reductions and other non-removal activities" emphasizing that carbon removal does not belong in the ETS bucket.

Carbon market watch echoes this (2023, p. 4), ”No removals certified under the CRCF should be used under the EU ETS” . The findings regarding CRCF in the contest of EU ETS can be divided into three groups. The first group, asking for an impact assessment of how CRCF could be integrated. The second group clearly advocating for an integration of CRCF into ETS. The Last group having separate targets for removals outside the ETS.

4.4 Summarizing the findings

The findings from the qualitative content analysis are as follows;
The carbon removal certification framework (CRCF) definition of carbon removal is unclear as it includes emissions reductions. This makes it difficult to know which solutions are eligible. The EU Commission should adopt a more robust definition consistent with the IPCC. Regarding the theme of CRCFs geographical scope, the EU needs to clarify how it will treat carbon removal activities with transboundary value chains and the CRCF can set a global standard as the first of its kind. There are three main positions regarding the use of CRCF in the European Union Emissions Trading System (EU ETS). The first group is requesting an impact assessment to determine if CRCF integration is feasible. The second group strongly supports integrating CRCF into the ETS. The third group is calling for separate targets for carbon removal outside of the ETS.

5.0 Discussion

In this chapter, the main insights will be presented and discussed thematically before the research limitations will be discussed followed by key recommendations. This research aims to identify patterns in the feedback material given on the EU Commissions' adoption of the proposed carbon removal certification framework (CRCF) and extract the key takeaways. The following research question is created to guide the research. *What are the main insights from actors involved in the carbon removal market who have been giving feedback on the EU's proposed carbon removal certification framework?*

5.1 Insights on how the CRCF defines carbon removal

A large majority (89%) of stakeholders who responded to the public consultation of CRCF agreed that *“establishing a robust and credible certification system for carbon removals is the first essential stepping stone towards achieving a net contribution from carbon removals in*

line with the EU climate-neutrality objective" (SWD, 2022, p.1). The European Commission highlights in their call for evidence for an impact assessment that the CRCF should identify types of carbon removal to consider and set robust requirements for quality (Ares, 2022a). Policymakers and stakeholders in the carbon removal space have called for a certification framework to build a "quality floor" in the carbon removal market, thereby establishing stakeholder's confidence, preventing greenwashing, and facilitating the effective operation of both voluntary and regulatory carbon markets (Fuss et al., 2018),(Carbon Direct, 2023). In other words, the different stakeholders in this space seem to be aligned on the foundations of CRCF. The definition of carbon removal could in many ways be seen as the cornerstone in the foundation setting the standard for the whole framework.

The European Commission have defined carbon removal in their proposed CRCF like this; *"Carbon removal' means either the storage of atmospheric or biogenic carbon within geological carbon pools, biogenic carbon pools, long-lasting products and materials, and the marine environment, or the reduction of carbon released from a biogenic carbon pool to the atmosphere"* (SWD, 2022, p.1). Clearly, the findings from the content analysis disagree with this definition. Carbon Gap clearly states what they find problematic*"Emission reductions from biogenic carbon pools, as included in the proposal's definition of carbon removals, do not meet the IPCC's definition and consequently should not be included in this proposal's definition"* (Carbon Gap, 2023, p.1)

There are several interesting discussion points here. Firstly why, as Carbon Gap also states, why have the European Commission chosen to create their own definition instead of supporting IPCC? Looking at the CRCF documents about the definition, they argue that they have made their own definitions "to fit the purpose of this regulation" without any further explanation. Secondly why does the definition explicitly include emission reduction as a part of a carbon removal activity? Fuss et al., (2018) highlights that the scaling and development potential depends on the ability to deploy portfolios of carbon removals consisting of different solutions rather than single solutions. As the finding shows, it makes this difficult to know which solutions are eligible and is counterproductive to establishing more clarity and stimulating the scaling of carbon removal solutions. Based on the material used in this study, a key insight is that it could look like the European Commission is undermining its proposal and thereby the problems it is meant to solve.

5.2 Insights on the geographical scope of CRCF

Peters & Geden (2017b) highlight the potential conflicts that may arise between countries regarding the implementation of carbon removal solutions. The geographical scope of the CRCF is as the bioenergy company Drax (2023) explains limited to *removals within the EU*. The findings emphasize that the proposal does not consider that carbon removal solutions often have what the NGO Zero Emissions Platform refers to as *transboundary value chains.* The European Commission highlights in its call for evidence for an impact assessment that climate change is a cross-border issue that requires coordinated EU action to supplement and reinforce national and local efforts. But as the findings criticize the current proposal makes it unclear how removals outside the EU and certificates issued outside the EU will be treated.

Tamme & Beck (2021), emphasize that developing a carbon removal policy today would reinforce the EU´s position as a global climate leader and reduce the cost of these technologies to support global access to carbon removal in the long term. Policymakers and stakeholders have called for an *international* certification framework to build a "quality floor" in the carbon removal market (Carbon Direct, 2023). The findings in this research emphasizes that the EU has the chance to establish a worldwide benchmark and should extend the alignment of removal certifications outside of Europe to guarantee recognition on a broader scale. (Bioenergy Europe, 2023)

Key insight from the material used in this study points in the direction of that the European Comission does not take into account that the carbon removal activity will also cross boarders outside the EU and the fact that an international scope is not only an opportunity to set a global standard but a necessity to for the CRCF to reach it intended purpose.

5.3 Insights on the CRCF in the context of EU ETS

What are the key insights from actors involved in the carbon removal market who have been giving feedback on the EU's proposed carbon removal certification framework?

In the EU Commission's proposal there is no mentioning of how the CRCF should operate in the context of the EU ETS. Based on this research, it is evident that there are three primary roles related to the CRCF within the EU ETS context. However, there is no clear pattern as to whether these roles belong to suppliers, NGOs, buyers, or other groups. The first group who consists of one supplier and two NGOs wants an impact assessment to determine if it's possible. The second group, comprising of a carbon removal supplier, a trader, a buyer, and two advisors, firmly advocates for incorporating CRCF into the ETS. The third group believes that separate targets for carbon removal should be set outside of the ETS and that the ETS is made for emission reductions and other none removal activities.

Regarding that the CRCF proposal is the first of its kind and is still at the proposal stage there is not much research done regarding its relation to the EU ETS but this topic will probably be highly debated in the years to come. According to Tamme & Beck (2021), if EU policy can commercialize large-scale carbon removal, these solutions can be implemented into policies, like the EU ETS. The material used in this study reveals two important insights. Firstly, the ETS is a significant topic for those involved in the carbon removal market. Secondly their opinions are divided in advocating for integration, keeping carbon removals outside, or wanting clarification on how the potential future linkages between CRCF and EU ETS.

6.0 Conclusion

This final chapter will summarize key research findings related to the research goals and questions, highlighting their value and contribution. Additionally, I will review the study's limitations and suggest areas for future research before wrapping up with a closing summary.

6.1 Key Findings & Contributions

This research aims to identify patterns in the feedback material given by specific respondents on the EU Commission CRCF proposal. To begin with, a review of relevant literature in the carbon removal space was conducted. The findings indicate that high-quality carbon removal solutions and mitigation pathways are vital to reach our climate goals and stop global warming (IPCC, 2022) To get carbon removal to Gt scale it needs to be reflected by national policies (Minx et al., 2018). Many countries have committed to net-zero targets, and over 120 of them include carbon removal, but few have robust plans or policies for achieving carbon removal at a significant scale (Smith et al., 2023). Tamme & Beck (2021), highlights that the EU provides a promising comprehensive climate policy but policymakers must address two gaps: commercialization and accounting. Currently, the voluntary carbon market actors develop standards, methodologies, and certifications (Ares, 2022a). Stakeholders and policymakers have highlighted this as problematic for three main reasons. First, there is no universal certification framework behind them; it is hard to assess and compare the quality of the carbon removal certificates, leading stakeholders not to trust carbon removal (Ares, 2022b) To tackle these problems policymakers and stakeholders in the carbon removal space have called for an international certification framework to build a *"quality floor"* in the carbon removal market. In 2021, the EU Commission revealed in its 2022 Work Programme a carbon removal certification framework (CRCF) proposal, with this a feedback period for the proposal was opened. The findings in this research were achieved through a qualitative content analysis on relevant responses from the feedback period in alignment with this study's aims and research question.

The primary goal of the CRCF proposal is to accelerate the implementation of high-quality, sustainable carbon removal methods, thereby rebuilding trust and combating greenwashing (Ares, 2022a). This study will contribute to identifying how stakeholders who are directly involved in the entire value chain of the carbon removal space view the first of its kind

proposal to a multinational (EU) carbon removal certification framework, and what they believe should be adjusted, removed or added to the proposal. This research highlights an important contribution that the primary goal of the CRCF proposal may not align with how carbon removal is *defined* in the proposal. This lack of alignment could lead to a lack of trust and encourage greenwashing instead of combating it.

Peters & Geden (2017b) stress the political implications of large scale removal and the potential conflicts that may arise between countries with regarding the implementation of carbon removal solutions. The results of this study could add to the discussion about the challenges faced by the EU CRCF due to its limited geographical reach, which doesn't cover the entire value chain. This reinforces Peters & Geden's argument about the difficulty in scaling and executing large-scale carbon removal efforts, as these efforts involve transboundary value chains that can span across multiple continents. This research provides valuable insights from stakeholders in the carbon removal industry regarding the proposed CRCF by the EU Commission. These insights can help policymakers make more informed decisions.

6.2 Limitations

This study has some obvious limitations, this is a master dissertation with a limited time frame and resources. Therefore the scope of the research is made quite narrow, looking at what a fraction of actors in the carbon removal space means about specific themes not capturing how other variables could affect the research and making it hard to claim if the findings can be generalized. It came as a surprise that only 23 of the total 210 respondents who gave feedback to CRCF proposal were relevant for answering the research question and resulting in a quite limited numbers of responses to analyze. This can also confirm the fact that high quality carbon removal solutions are quite nascent.

My experience as a researcher is also limited to a master's degree level, this being only the second bigger dissertation. There is a possibility that this research is heavily biased regardless of the fact that qualitative content analysis is highly systematic since my line of work is in the carbon removal space which may blind me from being objective when analyzing the data material. During the research process, selecting the appropriate methodology can have a significant impact on the outcome and be a limiting factor. However using a qualitative

content analysis that helps reduce data made sense taking into account the original size of the data material, this in contrast to other qualitative techniques that produce or add to data, the quantity of information gathered was comparatively limited.

This research is limited to the respondents who participated in the feedback period for CRCF proposal. Future research with more time and resources could use a more sophisticated approach expanding the scope and participants trough a survey-based research method.
It would have been interesting to use a research method more fitting for a larger part of the feedback material on the CRCF proposal. This could provide more generalizable data. During the review of carbon removal literature, a topic that stood out for further exploration is the potential research gap on the environmental justice and social impact of scaling up carbon removal, as highlighted by Nemet et al (2018). Surprisingly, this topic was scarcely mentioned by the respondents in this research.

6.3 Closing Summary

The research indicates that there are three main insights from actors involved in the carbon removal market who have been giving feedback on the EU's proposed CRCF; The proposal's definition of carbon removal is unclear, which may cause misalignment with the CRCF proposal's main goal. Additionally, the CRCF's geographical range within the EU may be too limited, as it does not consider the transboundary value chains of carbon removal solutions. Finally, there are differing opinions among the CRCF respondents regarding integrating the ETS, highlighting the need for an impact assessment on this matter.

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Abbreviations

NET – Negative emission technology

CDR – Carbon Dioxide Removal (bytte til å konsekvent skrive carbon removal)

CCS – Carbon Capture and storage

GHG – Greenhouse Gas Emissions

CRCF - EU Carbon removal Certification Framework

IPCC AR6 - Intergovernmental Panel on Climate Change´s Sixth Assessment Report

WGIII – Working Group III on the Intergovernmental Panel on Climate Change´s Sixth Assessment Report

CICERO – Center for International Climate Research

EC – European Commission