



MASTERARBEIT | MASTER'S THESIS

Titel | Title

Performative Struggles: Market Devices and the Enactment of
Carbon Dioxide Removal in European Climate Policy

verfasst von | submitted by

Paul Philip Wunderlich B.A.

angestrebter akademischer Grad | in partial fulfilment of the requirements for the degree of
Master of Arts (MA)

Wien | Vienna, 2024

Studienkennzahl lt. Studienblatt | Degree
programme code as it appears on the
student record sheet:

UA 066 906

Studienrichtung lt. Studienblatt | Degree
programme as it appears on the student
record sheet:

Masterstudium Science-Technology-Society

Betreut von | Supervisor:

Assoz. Prof. Mag. Dr. Maximilian Fochler

Acknowledgments

I am deeply grateful to Prof. Max Fochler for supervising this work and for helping me to keep the big picture in sight, even when it felt out of reach at times.

A heartfelt thank you to my brilliant fellow students in the STS master's program, from whom I had the privilege to learn so much during my time here at the department.

This sense of community extends to the dedicated faculty of the institute and the external lecturers. Special thanks to Prof. Alina Brad and Dr. Etienne Schneider, whose work on the CRCF contributed to my understanding of the topic and who, at the Political Ecology conference in Lund, offered warm and welcoming support during my first presentation of the concept of this thesis. To Sebastian Manhart, my earliest interview partner, thank you for generously sharing your insights into the emergent CDR community.

To my family – thank you for your constant support, no matter what.

And finally, to Becky, my partner in crime – look at us now!

Abstract

Turning the issue of climate change mitigation into a question of market design is not self-evident, nor is the translation trivial. This thesis investigates how the European Union's Carbon Removals and Carbon Farming Certification Framework (CRCF) transforms carbon dioxide removal (CDR) into a market object. Drawing on a detailed analysis of policy documents, assessment reports, and consultation processes, it unpacks the mechanisms underlying this transformation and their broader implications for the standardisation and marketisation of CDR.

The research demonstrates that establishing a carbon removal governance framework in the EU is a multifaceted process in which market-based logic is embedded throughout the framework. While the CRCF does not exclude the possibility of crediting mechanisms, this is only one aspect of its alignment with market-driven approaches. By strategically framing CDR as a win-win model that aligns economic and environmental objectives, and embedding it within existing carbon market infrastructures like the EU ETS, the CRCF leverages socio-technical systems to project costs, allocate funding, and legitimise CDR within established market frameworks.

It also emphasises how tools such as regulatory impact assessments and classification devices standardise diverse removal solutions into comparable formats, enabling experimental governance through a *'portfolio' approach*. Simultaneously, the consultation processes underpinning the CRCF are critiqued for standardising public input and sidelining critical voices, reflecting tensions between market-based governance and evidence-based policymaking.

A critical contribution of this research lies in its analysis of counterfactual policy baselines, which portray current voluntary markets as insufficient and thereby legitimise the CRCF as a necessary intervention toward greater *'harmonisation'*. These practices reflect broader dynamics in carbon accounting, demonstrating how institutional frameworks privilege certain governance models while marginalising alternatives.

This thesis underscores the performative nature of marketisation and standardisation processes, contributing to debates on institutional practices shaping CDR markets as well as publics. It calls for deeper engagement with collaborative policymaking and ethnographic studies of market infrastructures, offering insights into the complexities of designing governance frameworks for climate mitigation.

Table of Contents

1. Introduction.....	1
1.1. Introduction of the Case	3
1.2. Structure of the Thesis.....	5
2. State of the Art	6
2.1. Carbon Removal in Climate Policy: Emergence and Structuring.....	6
2.2. Devices of Enactment: Making Carbon Removal a Policy Issue	8
2.3. CDR in Climate Mitigation: Controversies and Policy Implications	9
2.4. Market Studies and the Social Construction of Carbon Removal	12
2.5. Public Engagement in Carbon Removal: Research Perspectives and Challenges.....	16
2.6. Interim Conclusion	18
3. Sensitising Concepts.....	21
3.1. Actor Network Theory	21
3.1.1. Performative Economics 1x1	22
3.1.2. Calculative Agencies in Action	23
3.1.3. Performativity as Political Practice	24
3.2. Public Engagement in Science and Technology	26
3.2.1. Politics as a Socio-Material Practice	27
3.3. Interim Conclusion	28
4. Research Questions.....	30
5. Research Field, Data and Methods of Data Collection	33
5.1. The Policy Assemblage.....	33
5.2. Engagement with the Market-in-the-Making	35
5.2.1. Data Conversion & Sampling	35
6. Methods.....	38
6.1. Qualitative Document Analysis	38
6.2. Practice-Oriented Document Analysis	42
6.3. Thematic Analysis and Iterative Coding.....	44

6.4.	Limitations	47
6.5.	Interim Conclusion	48
7.	<i>Empirical Findings</i>	49
7.1.	Carving out a Domain for a Market	49
7.1.1.	The Circular Economy Action Plan	50
7.1.2.	The Farm To Fork Strategy	51
7.1.3.	The Sustainable Carbon Cycles Communication	54
7.1.4.	Interim Conclusion	66
7.2.	Market Devices in Action	68
7.2.1.	Impact Assessments: A Brief Overview	69
7.2.2.	Tracing the Actors Behind Impact Assessments	70
7.2.3.	Fiches as Mediators: Rendering Removal Solutions Equivalent	72
7.2.4.	Standardising Certification Mechanisms for Comparability	79
7.2.5.	Consultation Strategies as Market Devices	87
7.2.6.	Interim Conclusion	100
7.3.	Performative Struggles Around Market Devices	101
7.3.1.	From Critique to Compliance: The EU's Appropriation of Market Contestation	103
7.3.2.	Challenging the EU's Public Consultation as a Market Device	107
7.3.3.	Land-Based Removal Practices: Socio-Material Impacts of Carbon Markets	111
7.3.4.	Interim Conclusion	115
8.	<i>Discussion</i>	116
8.1.	Constructing Market Devices Through Documents	116
8.2.	Shaping and Constraining Public Engagement Through Documents	121
9.	<i>Conclusion</i>	127
10.	<i>References</i>	130
11.	<i>Annex</i>	I
11.1.	Codebook for Analysing NGO Engagement	I
11.2.	Questionnaire – Call for Evidence, European Commission 2024	II
11.3.	Overview Empirical Data from the Call for Evidence	IX
12.	<i>Abstract in German</i>	XII

Glossary

ANT – Actor-Network Theory

BECCS – Bioenergy with Carbon Capture and Storage

CCS – Carbon Capture and Storage

CCU – Carbon Capture and Utilisation

CDR – Carbon Dioxide Removal

CDM – Clean Development Mechanism

CEAP – Circular Economy Action Plan

CRCF – Carbon Removals and Carbon Farming Certification Framework

DACCS – Direct Air Carbon Capture and Storage

DG – Directorate General

DG CLIMA – Directorate-General for Climate Action

EU – European Union

ETS – Emission Trading System

EUCOM – European Commission

EW – Enhanced Weathering

FFS – Farm to Fork Strategy

GHG – Greenhouse Gas Emissions

IAM – Integrated Assessment Models

IPCC – Intergovernmental Panel on Climate Change

LULUCF – Land Use, Land Use-Change and Forestry

MRV – Monitoring, Reporting, and Verification

NET – Negative Emission Technology

NGO – Non-Governmental Organisation

NBS – Nature-Based Solutions

PES – Public Engagement with Science

PUS – Public Understanding of Science

RCP – Representative Concentration Pathways

SCC – Sustainable Carbon Cycles Communication

SRM – Solar Radiation Management

STS – Science and Technology Studies

TBS – Technology-Based Solutions

“The laws of the social world may exist, but they occupy a very different position from what the tradition had first thought. They are not behind the scene, above our heads and before the action, but after the action, below the participants and smack in the foreground. They don't cover, nor encompass, nor gather, nor explain; they circulate, they format, they standardize, they coordinate, they have to be explained.” (Latour 2005, p. 246)

1. Introduction

In recent years, carbon dioxide removal (CDR) has become a central focus in climate mitigation, particularly since the 1.5 Special Report of the Intergovernmental Panel on Climate Change (IPCC, 2018) highlighted its necessity in balancing residual emissions. With the IPCC integrating CDR capacity across all of its emissions pathways (Beck & Mahony, 2018), efforts to integrate these technologies into climate policies and regulatory frameworks have accelerated. Yet CDR's technical scalability remains highly uncertain, and there are mounting concerns that positioning CDR as part of climate mitigation could potentially undermine more immediate emissions reduction efforts. Questions over how CDR should be governed – and whether it could actually delay or deter ambitious climate actions – are increasingly urgent.

While social science studies have focused extensively on the risks of "mitigation deterrence" (e.g. Carton et al., 2023; Brad & Schneider, 2023), drawing from insights in cultural political economy as well as science and technology studies, I propose to approach the integration of CDR into climate policy from a slightly different angle. A key example in the regulatory landscape for CDR is the European Carbon Removals and Carbon Farming Certification Framework (CRCF). Adopted by the European Commission in 2023 (European Commission, 2022e), this framework is intended to set standards for certifying and standardising carbon removal practices, alongside related domains like carbon farming and carbon capture and utilisation.

By focusing on this governance process at the European level – often hailed as a landmark CDR legislation or even a "gold standard" for certifying carbon removal – I aim to examine the prevalent regulatory tendency to frame CDR as a *market object* (Asayama et al., 2021). This approach examines how CDR is rendered governable, amidst ongoing controversy over its intended role, by carving out a new domain for a carbon removal market while simultaneously integrating it into existing carbon market infrastructures, both discursively and materially.

This focus ties my thesis on the relatively novel concept of CDR in climate mitigation to a longer history of studies on the practical efforts and consequences of commodifying and marketising carbon and carbon technologies (Callon, 2009; MacKenzie, 2009; Dalsgaard, 2016; Asiyanbi, 2017). As we know from studies on other fields of technoscientific development, once infrastructures are established, their influence becomes profound yet

difficult to disentangle (Bowker & Star, 2000; Edwards, 2010; Collier & Lakoff, 2021). Just as these infrastructures often become stabilised and "black-boxed", regulatory frameworks that enact market infrastructures also need to be examined for their capacity to shape long-term outcomes and structures in ways that may eventually become invisible or taken for granted (MacKenzie, 2006; Callon, 1998; Çalışkan & Callon, 2010; Fourcade & Healy, 2013).

Through an analysis of key documents that supported the adoption of the CRCF, I explore how the regulatory process is shaping the socio-technical infrastructure of the CDR sector, with potentially lasting effects. Using a practice-oriented, genealogical approach (Asdal & Reinertsen, 2022) to uncover the policy process of the CRCF in its unfolding I am employing Callon's (2007) concept of *agencement*. That is to view the proposed framework as a sociotechnical arrangement that qualifies objects, defines the rationality and relationality of actors, and organises market exchanges.

Borrowing Callon's language of 'hot' situations (1998b), where overflows and instabilities dominate, efforts in research and policy to stabilise the dynamic field of CDR are frequently met with contestation. Marres' (2005) insight – 'no issue, no public' – as well suggests that as the policy proposal takes shape, it eventually enacts certain issues as public concerns. Observing these instances within the scope of the CRCF might reveal how CDR is enacted as an issue and provide insight into how such framings either open or restrict pathways for the formation of engaged publics.

In this thesis, I thus focus on how different kinds of publics emerge and engage with the evolving CDR market in the process of its enactment. Therein, a key focus is placed on how NGOs engage with the consultation process of the CRCF and how they might resist the marketisation of CDR as such. Rather than examining their individual positions, I am focussing on their distinct engagement with the consultation as a market device. By paying attention to instances, in which the CRCF is contested as a market device, I examine how the framework is negotiated, reshaped, or solidified by the interplay of a range of actors inside and outside of the European Commission's decision-making process. This analysis reveals the complex relationship between critique and marketisation within technocratic activism (Blok, 2011; de Moor, 2018; Ehrenstein, 2022).

In this way, this approach reveals that regulatory efforts go beyond technical standard-setting: they actively shape what qualifies as a public issue, define some of the spaces where engagement can take place, and construct different kinds of publics as a result in the development of the CDR market infrastructure.

1.1. Introduction of the Case

But before I jump ahead of myself, it is reasonable to shortly explain to the reader, the context and scope of this case. If you are not too familiar with the idea of CDR, I believe, it is important to note that CDR is not considered as a coherent technological concept. Rather, it is an umbrella term that “encompasses various deliberate human approaches that can remove CO₂ from the atmosphere and store it in oceanic, terrestrial or geological reservoirs over climate-relevant timescales of decades to millennia” (Anderson, et al. 2023, p. 808). Over the past 20 years, the perception of CDR at scale has shifted from being viewed as a lunatic idea of geoengineering to a viable political and scientific project (Möller, 2020). Latest since the aforementioned SR 1.5 report of the IPPC, CDR has become part of national and international climate mitigation agendas. However, the feasibility and scalability of these technologies remain uncertain (Smith et al., 2023).

Many governments are introducing innovation and subsidy programs to promote carbon removal as a solution for achieving a net-zero economy. However, a coherent monitoring framework for carbon removal would still be missing for many corporate and industrial actors (Arcusa & Sprenkle-Hyppolite, 2022; Michaelowa et al., 2023). To address what it identifies as a ‘market failure’ in the legislative proposal, the European Union has introduced the CRCF, a regulatory framework designed to create the first comprehensive governance structure for carbon removals. The diagnosed ‘market failure’ would arise from two factors: First, carbon removal certification is less common than emission reduction certification, creating methodological challenges. Second, carbon removal activities differ in maturity, cost-effectiveness, and monitoring costs, posing certification challenges. Based on four Qu.A.L.iTY criteria - Quantification, Additionality and baselines, Long-term storage, and sustainability – carbon removals are to be better checked, measured, and verified (European Commission, 2022e). In so doing, the CRCF aims to address gaps in accountability, encourage technological development, and foster a foundation for new carbon markets (Schnenuit et al., 2023).

Interestingly, the evolution of the CRCF’s acronym reflects the complexities inherent in regulating such a dynamic field. The intention to establish “a regulatory framework for certification of carbon removals” first appeared in the Circular Economy Action Plan (CEAP) in 2020 (European Commission 2020a, p. 16). As has already been noted by others (e.g., Brad & Schneider, 2023) and will be explored in more depth in the empirical analysis (cf. Section 7.1.), this project has, from the outset, encompassed more than strictly carbon removal activities. Its boundaries are flexible, extending to technologies and approaches that might be better understood as emission reduction measures, such as carbon farming, or as methods that only temporarily delay emissions, as is the case with carbon capture and utilisation. Only consequentially, some might say, the name of the regulatory proposal evolved. Initially, the

acronym CRCF stood for the “Carbon Removal Certification Framework” during the regulatory development phase (European Commission, 2022e). However, following the approval of the regulatory text in the trilogue negotiations with the European Parliament and Council, the name was updated to its current form: the “Carbon Removals and Carbon Farming Certification Framework” (European Commission, 2024a).

This semantic shift highlights the complexities within the regulatory process and presents the CRCF as a framework of overflows and instabilities. Since the proposal’s adoption by the European Commission in 2022 and the subsequent agreement with the European Parliament and Council in early 2024, implementation has progressed into a structured phase. The Commission, with support from an Expert Group on Carbon Removals, will develop specific EU certification methodologies for various carbon removal practices through so-called ‘delegated acts’. This Expert Group was established by Directorate-General (DG CLIMA) as an informal Commission expert group on carbon removals “to assist the Commission’s Directorate-General for Climate Action (DG CLIMA) in the preparation of policy initiatives and related legislative proposal”, “to bring about an exchange of experiences and good practices from existing public and private initiative” and to assist in the preparation of the implementing and delegating acts (European Commission, 2022f).

In 2025, the Commission plans to release the first three certification methodologies for specific carbon removal solutions: Direct Air Capture and Storage (DACCS), Bioenergy with Carbon Capture and Storage (BECCS), and Biochar. In parallel, the Commission plans to issue implementing acts to establish technical rules for third-party verification, specifying required processes for certification schemes, certifying bodies, and audits. After this phase, certification schemes that meet the CRCF’s criteria will be officially recognised by the Commission, following an evaluation of their governance, rules, and practices.

Through this approach, the CRCF aims to bring standardisation and credibility to the evolving carbon removal sector. However, whether this regulatory framework will achieve its goals – or if further stages of regulation will emerge – remains to be seen. As Brad & Schneider (2023) note in their analysis, experts regard the CRCF as a transitory step, intended to pave the way for the eventual integration of carbon removals into the EU Emissions Trading System (ETS). This ongoing experimentation makes it particularly important to analyse the underlying conditions and efforts shaping CDR as a market object. By understanding the mechanisms and practical measures currently in place, we can gain insights into the broader process of transforming CDR into a viable and regulated element of climate policy.

1.2. Structure of the Thesis

After this short introduction on the scope of this thesis and the case at hand, I begin by reviewing the social science literature on CDR, alongside research on the standardisation and commodification of carbon, and recent studies on public engagement with CDR. This will set the stage for a more detailed look at how the CRCF sits within these wider discussions (cf. Section 2.).

Next, I lay out the conceptual framework I'll use to analyse the CRCF. Here, I draw on performative economics within Actor-Network Theory, social studies of markets, and the idea of politics as a socio-material practice. These theories offer a way of viewing the CRCF as a regulatory project with the power to shape markets and define roles for various actors (cf. Section 3.).

Methodologically, I use a practice-oriented document analysis approach, inspired by Asdal and Reinertsen (2022). In this section, I explain how I selected and analysed my data, detailing the selection of documents I sampled, and the methods I used to interpret them. This will clarify how I approached the regulatory process of the CRCF in its unfolding (cf. Section 4.-6.).

The empirical part of the thesis then unfolds across three main sections. I start by examining three core policy papers from the European Commission after the release of the SR 1.5 report, tracing how CDR is enacted as a market object in the context of the broader discussion of an uptake of carbon removals and carbon farming into European governance frameworks (cf. Section 7.1.). I then take a closer look at the preparatory work of an external consortium of consultants that assisted in creating the Impact Assessment for the regulation. Specifically, they contributed to reviewing various carbon removal solutions and certification mechanisms, as well as preparing and analysing the stakeholder consultation within the Call for Evidence. Here, I will focus on how these activities function as distinct market devices within the regulatory process (cf. Section 7.2.). Finally, I examine the responses from environmental groups and organisations, analysing their engagement with the CRCF process and contrasting this with how the Commission's documents frame such engagement (cf. Section 7.3.).

In the discussion (cf. Section 8.), I synthesise my findings and relate them back to the issues highlighted in the State of the Art. This allows me to place the CRCF within a wider context, demonstrating how it not only standardises CDR as a technological artefact but also actively shapes spaces for public engagement and derives a distinct governance approach for the development of emerging carbon removal markets.

2. State of the Art

This review begins by situating carbon dioxide removal (CDR) within its broader trajectory as a site of technoscientific controversy, examining how carbon removal has evolved from a marginal topic associated with the idea of geoengineering to a viable policy domain. To situate my inquiry into CDR's regulatory landscape, I then discuss research from the social studies of markets, with an emphasis on the commodification and marketisation of carbon. This literature provides essential insights into the institutional and economic forces that shape carbon markets, grounding this study in the broader historical and structural context of carbon policy.

Following this, I draw on a smaller yet growing body of literature that addresses public engagement with CDR from a pragmatist or co-productivist perspective. These studies reveal how engagement processes impact the framing and legitimacy of CDR, as well as the interpretive dynamics that arise as CDR becomes more deeply integrated into climate policy. Together, these themes establish a foundation for exploring the emerging regulatory frameworks for CDR and examining how various actors contribute to CDR's evolving role within climate governance.

2.1. Carbon Removal in Climate Policy: Emergence and Structuring

In a remarkably short time, it seems, the concept of carbon removal has shifted from a marginal and controversial topic in scientific discussion to a principle that increasingly shapes both political and public debates on climate policy. This shift is accompanied by several new concepts, most notably the terms “net zero” and “negative emissions”. The history of this rise can be traced through the appearance of these terms in key political documents, such as the articulation of the 1.5°C targets (Cointe & Guillemot, 2023) following the Paris Climate Agreement, and the formulation of net zero goals by corporations and states or state coalitions (Hale et al., 2022). However, what these terms mean and how they are operationalised is highly variable and subject to empirical scrutiny, as these concepts often do not necessarily entail action but sometimes merely substitute for it (Geden, 2016).

In this master's thesis, I aim to examine a case study on how the concept of CDR is handled organisationally. To do so, I will draw on insights from interdisciplinary social sciences, particularly those focusing on the historical emergence of the concept. Schubert (2022) adopts a *longue durée* perspective, tracing how proposals for deliberate climate modification in the U.S. evolved in response to climate change, reflecting shifting dynamics between the physical climate sciences and the state. Möller (2022), in contrast, examines the role of academic networks in the early 2000s, exploring how CDR emerged not only through scientific discourse but also as a concept influenced by divergent political and social interests. Both studies suggest that the evolution of CDR is not solely about improving technological feasibility or

understanding geophysical interventions, but also involves the interplay of values and socio-political factors.

The debate around geoengineering has historically centred on whether such methods should be considered or researched at all. Today, however, both political and scientific discussions are increasingly focused on how these methods might actually be implemented. To understand how CDR has become a governable idea, scholars often examine the social dynamics that have shaped the creation of knowledge surrounding it. Möller (2023), for example, highlights the pivotal role of small scientific networks in advancing the CDR field between the 1990s and early 2000s, despite persistent public concerns.

In light of this, she underscores the influence of prominent figures, such as Nobel laureate Paul Crutzen, whose high profile and advocacy for geoengineering as a technological solution to climate policy challenges contributed to the elevation of CDR from a peripheral concern to a central topic of research and policy discourse, coinciding with the 2009 Royal Society report, "Geoengineering the Climate: The publication of "Science, Governance and Uncertainty" also contributed to a shift in focus. For a long time, the concept of carbon removal was grouped together with approaches under the umbrella of solar radiation management (SRM) and collectively framed as variants of geoengineering. One of the key impacts of the Royal Society's publication was the establishment of two distinct categories based on their geophysical dimensions and thus a differentiated terminology around the concept of geoengineering and their practical and regulatory effects.

This authoritative dimension – which has been examined as a core element of scientific work in other prominent cases of techno-scientific controversies (Collins & Pinch, 1998) – can, in the context of geoengineering, and more specifically CDR research, thus be seen as a catalyst for the development of several coordinated research programs on geoengineering and increased governmental inquiries (Möller, 2020). Rather than asking if geoengineering should be pursued, the question slowly turned into *how* these methods might be used and governed including aspects on public acceptance (Bellamy et al., 2013). This development marked a more practical approach, viewing geoengineering as a set of tools that require clear oversight and management.

The establishment of these two distinct categories – CDR and SRM – which are now rarely questioned, is the result of complex debates and a terminology that could have taken other directions. Möller's research highlights that historically, there were different ways to classify these approaches. In addition to categorisation by physical processes, some had suggested grouping technologies by the degree of "black-box engineering" involved or by their intervention into "open" or "closed" systems. This question of classification is significant because,

beyond the geophysical components, regulatory aspects – such as the scale or area of intervention and how these technologies align with existing environmental laws – might have been better integrated under alternative categorisation schemes. Thus, the Royal Society report, by categorising the different approaches, imposed certain epistemological and ontological consequences:

„Thanks to the CDR and SRM categories, the main defining aspect of geoengineering – scale – became obscured by the microlevel mechanisms of carbon sequestration and reflectivity potential that were being studied.“ (Möller, 2020, p. 26)

In this framework, CDR was labelled as the less risky and less problematic counterpart compared to SRM, especially regarding social considerations and the need for additional regulatory mechanisms. These debates reveal just how powerful the act of categorising and standardising previously diverse phenomena and technologies can be, as well as the far-reaching consequences that such classifications can bring about.

2.2. Devices of Enactment: Making Carbon Removal a Policy Issue

Next to these knowledge sociological perspectives on CDR, other studies on climate science, technology development, and policymaking have highlighted specific “technologies of anticipation” (Alvial-Palavicino, 2015; Dolez et al., 2019) that shaped how CDR is understood and integrated into global governance frameworks.

A central issue in that regard is the large-scale integration of so-called Negative Emission Technologies (NETs) into the Representative Concentration Pathways (RCPs) of the IPCC. The scaling of *one* removal solution – the use of Bioenergy with Carbon Capture and Storage (BECCS) – in the modelling of RCP 2.6 offered a pathway to project scenarios that would allow the 2°C target to be met; an achievement that was taken with great enthusiasm especially among policymakers. Notwithstanding the expression of profound concern regarding this bet (Fuss et al., 2014), the highly speculative assumption of the potential of BECCS deployment created “a slippery slope from a possible pathway to a political reality” (Beck & Mahony, 2017 p. 312).

Going back, there is a chain of translations that has made these modelling attempt possible in the first place. Such are the creation of a global infrastructure for satellite and measurement systems (Edwards, 2010), which in the first place allowed for the development of global climate models (Guillemot, 2022), the formulation of recognised and formalised temperature targets (Randalls, 2010; Cointe & Guillemot, 2023), as well as the use of integrated assessment models (IAMs) to project socio-technical pathways for addressing the pressing issue of climate change (Beck & Mahony, 2017). The goal of these IAMs, is to integrate economic cost-benefit models with Earth system models, consequently narrowing down to the “least costly” and “most

stable” way of achieving a specific temperature target – while necessarily excluding other political and social questions.

What these infrastructures and technologies of anticipation created, is a unified perspective of climate change as a problem of global scale (Hulme, 2010). This perspective is also instrumental in conceptualising the global carbon budget – a concept that defined a finite amount of carbon emissions that can be released to meet underlying global temperature targets (Lahn, 2020). Thereby, this concept also introduced or leveraged the idea of a calculable balance between emissions and removals, shifting the focus from a multilateral distribution of emissions rights to a regime that is increasingly reliant on running a deficit to secure an established temperature target, using “offset technologies as ways to circumvent admitting policy failure” (Asayama et al., 2021.p. 4).

Again, this perspective laid the foundation for a range of powerful yet contested concepts on the brink of science, policy and the economy, such as “net-zero” (Rogelj et al., 2019), or the concept of “overshoot” (Preston, 2016) anticipating a temporary exceedance of emissions limits that will be later corrected by NETs. Each of these tools has played a significant role in fostering the idea that greenhouse gas concentrations can be calculated and decisively influenced through technological interventions, such as CDR.

Simply put, it’s like the saying, “when you have a hammer, everything looks like a nail”: when you have a global climate model, the solutions to tackling climate change tend to look a lot like forms of geoengineering (Möller, 2020). What may present itself here as a linear story of different types of practices of anticipation and their realisation in short time, is of course a much more complicated picture with many twists and turns, and importantly a yet uncertain future. What these analyses reveal is how the dominant logic of a technological fix – optimising a globalised climate for cost-effectiveness – is constructed and sustained through various socio-technical practices and infrastructures.

A common criticism that emerges from these empirical studies is that this managerial approach to accounting for emissions does, in fact, not provide effective insight into the practices associated with CO₂ emissions, but rather tends to obscure these developments. Social and ethical issues in the treatment of emissions reduction and removal would take a back seat. The attractiveness of commensuration narrows the view of decision makers and leads to a removal of values from the policy discourse, which Hulme (2011) also calls ‘epistemological reductionism’.

2.3. CDR in Climate Mitigation: Controversies and Policy Implications

As noted above, geoengineering in general and CDR in particular are subjects of considerable controversy. In terms of a science and technology studies (STS) perspective, controversy

encompasses any scientific and technological elements that are not yet stabilised, closed, or “black-boxed” (Macospol, 2007: 6 in Venturini, 2010, p. 260). From an analytical point of view, these situations offer a great opportunity to analyse both the efforts being made to stabilise and contest the issue at stake.

The framing of the controversy on CDR thus, of course, depends on one’s standpoint. A useful orientation to the current state of the debate is provided by Glen Peters in a recent opinion piece published in *Nature Reviews Earth & Environment* (Anderson et al., 2023). Peters identifies two main areas of controversy: first, discussions on the *technical feasibility at scale* and second, the use of CDR in *mitigation discourse*. In this thesis, I am to focus primarily on the latter to see how CDR as a concept is integrated into existing climate policy. However, employing an STS perspective involves viewing the material and discursive effects as interconnected.

A significant part of literature examining the use of CDR in mitigation discourse comes from the fields of cultural or political economy (Markusson et al., 2018). This perspective shares several common assumptions and characteristics with STS, as it examines the interactions between technologies, society, and political-economic power. Studies from this approach highlight how carbon removal as a concept may function as a *promissory regime* (Nerlich et al., 2024) that potentially hinders immediate climate mitigation efforts while promoting visions of a spatio-temporal fix (Carton, 2019). This analytical lens, which underpins a number of publications, is therefore often referred to as *mitigation deterrence*.

Although it is difficult to make a definitive statement as to whether individual technologies or the concept of CDR as a whole is responsible for delaying climate action (Carton et al., 2022), an increasing number of empirical studies are examining this potential for ‘mitigation deterrence’. A recent special issue in *Environmental Science & Policy* (Markusson et al., 2024) brought together several of these case studies. For instance, by analysing the rhetorical strategies of actors in the petrochemical industry, Palm et al. (2024) examine the industry’s vision of a ‘circular carbon’ economy, where carbon is repurposed as a valuable feedstock for industrial production – a vision built on speculative technological promises. Similarly, Hougaard’s (2024) case study on biochar as a policy solution in Denmark investigates how it is increasingly positioned as a viable mitigation strategy, yet one that aligns with sustaining current production and consumption patterns, thereby posing a potential risk of mitigation deterrence.

Notably, the reflexivity among actors within the emerging ‘CDR community’ regarding the potential of moral hazard or mitigation deterrence is found to be quite nuanced. Rothkirch et al. (2024) demonstrate this through the example of the Swiss ‘CDR community’, where the emphasis on established narratives around ‘emissions reduction first, removal second’ serves

to counter discourse-related concerns about CDR's role in climate mitigation. Ironically, this emphasis allows critical issues in scaling CDR – specifically, the questions of how much capacity is feasible and for what purposes it should be allocated – to be sidestepped. The concept of 'residual emissions' – those deemed unavoidable with current technologies and therefore expected to be offset by CDR solutions – adds a layer that demands further scrutiny. Within this context, Lund et al. (2023) explore how 'necessity' and 'feasibility' in defining residual emissions and determining which actors can claim them should be seen as socially constructed concepts.

In the same special issue, Brad and Schneider (2023) connect concepts from cultural political economy, particularly historical-materialist policy analysis, with the notion of sociotechnical imaginaries. They present a conceptual approach to apply the mitigation deterrence perspective within policymaking, specifically examining the development of the Carbon Removals and Carbon Farming Certification Framework (CRCF). Their analysis investigates how, within this process, traditional mitigation strategies and goals may be weakened by being positioned as equivalent to CDR policies. Though their analysis is situated relatively early in the policy process, two critical points emerge regarding the mitigation deterrence potential of the CRCF. Firstly, they identify the missing introduction or announcement of a separate removal target alongside the established emissions reduction target in European climate law. Secondly, the recently published regulatory proposal does not specify the purposes for which carbon removal credits may be used; moreover, the Commission has opted not to exclude the offsetting of emissions reduction efforts through removal credits.

While their analysis is crucial to point to the tendency towards an 'offsetting approach' of CDR, supporting the analysis of Asayama et al. (2021) mentioned above, their focus is less on how this enactment of CDR as a commodity comes about. True to a historical-materialist approach they rather seek to identify the emerging actor coalitions shaping this space alongside the analysis of the regulatory design. In my analysis, I will thus try to connect to their study on the CRCF and focus on the processes through which CDR is enacted as a *market object*, particularly examining how material infrastructures, institutional frameworks, and bureaucratic practices interplay to stabilise and reproduce this idea of a commodification.

With these questions concerning the measurement and evaluation of CDR, we are approaching another field of literature that I would also like to shortly introduce in this review. This area, though not strongly connected with the CDR discussion yet, is particularly relevant for understanding the case explored in this thesis: the standardization and marketisation of carbon technologies.

2.4. Market Studies and the Social Construction of Carbon Removal

Turning the issue of climate change mitigation into a question of market-design is not self-evident, nor is the translation trivial. It requires a shift in perspective, treating climate interventions not merely as a geophysical challenge but as economic operations that can be measured, traded, and regulated. This approach, while primarily rooted in emissions reduction, raises issues directly applicable to CDR – especially as CDR solutions are increasingly folded into existing carbon markets and trading schemes. For instance, questions about how to value, track, and verify CDR actions parallel longstanding challenges in the carbon market, such as maintaining credibility and transparency within emissions trading systems.

There is a well-established knowledge base around processes of creating economic markets for different kinds of environmental goods and technologies, such as cleantech or biofuels in the European Union (Doganova & Laurent, 2016), but also very prominently, for the intervention into the concentrations of specific gases. Starting from what is considered the very first instance of a large-scale experiment with market-based environmental regulation on the SO₂ allowance trading system in the US (Lane, 2012) to the development of similar systems with the aim to reduce greenhouse gas (GHG) emissions through carbon markets. Notably, carbon markets have been analysed in their efforts to ‘making gases the same’ (MacKenzie, 2009), that is to convert different GHG reductions efforts into quantifiable, exchangeable units or ‘asset classes’ (Paterson & Stripple, 2014), which in turn demands standardised metrics, verification procedures, and regulatory frameworks.

At the core of these processes thus lies the transformation of carbon and other gases – such as nitrous oxide or perfluorocarbons – as physical materialities into carbon markets as socio-material constructions (Knox-Hayes, 2013), reflecting the principles of economic theory that support market mechanisms to price natural resources and internalise environmental ‘externalities’¹ (Coase, 1960). Since the 1990s we are witnessing various contingent types of carbon market mechanisms. Broadly, they are separated into compliance and voluntary markets, of which both can be further differentiated into cap-and-trade systems and schemes which are based on a baseline-and-credit structure (Paterson & Stripple, 2014). As the name suggests, cap-and-trade systems define a cap on the amount of carbon-equivalents that can be emitted by corporations, whereas in baseline-and-credit systems each emitter is assigned a baseline level of emissions based on historical levels or industry benchmarks. Both these systems create different forms of carbon commodities, which are in turn, however, also to some extent interchangeable between different systems. The EU Emission Trading System (ETS) is the

¹Similar systems have evolved for the pricing of forestry (Cashore et al., 2004), biodiversity (Mace, 2014) or clean water (Bakker, 2007).

largest and most established example of a compliance cap-and-trade system with a current coverage of GHG emissions from around 10,000 installations in the energy sector and manufacturing industry as well as aircraft operators (European Commission, n.d.-a). The Clean Development Mechanism (CDM), established alongside the Kyoto Protocol and currently transitioning into a new framework under Article 6 of the Paris agreement, being a prominent, yet also highly controversial example of a baseline-and-credit system.

While there is a huge literature on individual carbon markets, especially on questions of effectiveness or policy design, there is less literature on how these markets, in the words of Paterson & Stripple (2014), are 'put together'. When approaching the development of the CRCF, as the case of this thesis, I aim to do exactly that, that is to examine how governable domains aimed at creating market conditions become established *in practice*. Looking closely at the institutional practices, knowledge networks as well as possible sites of contestation therein, might help us to further explain the organising efforts and effects of these complex socio-material processes.

For instance, Braun's ethnographic research (2009) on the emergence of the EU ETS tells the story of how a network formed within the DG Environment involving departmental members, but also non-governmental organisations, and industry representatives, which accumulated specialised knowledge on emissions trading, contributing significantly to the advancement of the compliance carbon market scheme. His paper emphasised the importance of knowledge networks in today's policy making process and especially in the multi-level system of the EU, which lends itself to the formation of such policy networks. Michel Callon, in his conceptualisation of carbon markets as collective experiments has also termed these assemblages 'networks of experimentation':

"The intention is clearly to build up competencies, to develop a learning dynamic, and to construct networks of knowledgeable people and experts from all disciplines who commission studies and enroll both specialists and NGOs. This is what can be called a community of practice or a collective of research and experimentation on carbon markets has come into being." (Callon, 2009 p. 538)

The way in which this process is organised, but also possibly contested by external actors must be the subject of empirical investigation. As what can be seen in many instances, processes of techno-scientific innovation in general, and carbon marketisation in particular stimulate civic engagement and often give rise to substantial protest. Ehrenstein (2022) has analysed the practices of environmental NGOs vis-à-vis carbon markets in the case of the EU ETS. What she describes in her ethnographic study as 'technocratic activism' is understood as "a

discreet mode of political action that stands in sharp contrast to the highly visible mobilisations of different climate and social justice movements". (Ehrenstein, 2022 p. 12)

The practices of these organisations within the 'Brussels ecosystem' must be understood in the context of the phased development of the EU ETS, whose ongoing revisions and expansions capture their attention. Callon describes this evolving nature of carbon markets as existing "between in vitro and in vivo experiments" (2009, p. 35) – wherein the structural framework develops within the confines of bureaucratic apparatus and with the aid of economic theory (in vitro), while also undergoing constant restructuring and adaptation in real-time operations (in vivo). According to Ehrenstein, the organisations she observed approach these technical refinements with a sense of critical scrutiny rather than outright rejection.

This dynamic aligns with what de Moor (2018), in her analysis of transnational climate activists within the UN negotiations context, describes as the 'efficacy dilemma'. In the case of lobbying for EU ETS improvements, the efforts of the technocratic NGOs are especially shaped by the temporalities of bureaucratic processes and the imbalance of time and resources compared to, for example, industrial actors.

Despite these challenges, Ehrenstein's analysis finds that these organisations continue to adhere to a reformist approach, contrasting with more radical initiatives that reject market-based policies and would prefer to abolish the EU ETS altogether. This form of technocratic activism highlights the difficulties of making such a market mechanism meet its intended objectives, illustrating the complex interplay between policy reform efforts and entrenched market structures.

Beyond the European Union, Anders Blok (2011) offers a complementary perspective on the marketisation of carbon, demonstrating how these processes can become active sites of political contestation. Blok's study of carbon market dynamics, particularly those following the Clean Development Mechanism (CDM), which was established under the Kyoto Protocol to facilitate emissions reductions through market-based mechanisms, provides insight into the contestation surrounding these markets. The CDM, a prominent baseline-and-credit system, has long been the subject of controversy due to concerns regarding its environmental integrity and equity. It is currently undergoing a transition under the Paris Agreement's Article 6 framework. In his analysis, Blok identifies and examines various modes of NGO involvement in the Global South, employing practical tools to re-politicise carbon markets. Blok introduces three ideal-typical modes of NGO engagement – 'consuming,' 'engaging,' and 'confronting' – to explore the ways in which NGOs mobilise resources and encourage public participation in the politics of science and technology. Through these modes, Blok illustrates two empirical cases

where contestation emerges, demonstrating that carbon markets are not only merely economic mechanisms but also arenas for political critique and agency.

These case studies highlight the changing roles of actors and coalitions that emerge during the process of carbon marketisation, as well as the diverse practices these groups develop. Unlike some earlier studies, they do not simply criticise carbon markets as a post-political enforcement of a universal market ideology (Lohmann, 2005; Swyngedouw, 2011). Nor do they adopt a purely technical or market-focused view that reduces political concerns to individual *attitudes* (e.g., MacKenzie, 2009) or frames carbon markets as naturally constructive and *civilising* forces (Callon, 2009). Instead, these case studies take a more balanced approach. They explore the strategies used within marketisation processes and consider how these processes might create opportunities for public engagement and democratisation (Marres, 2007; Bryant, 2016).

In the same special issue on “Mitigation Deterrence and Carbon Removal in the Age of Net Zero” mentioned in the previous section, Price et al. (2024) conduct an analysis of the marketisation process for biochar as a specific CDR technology in the UK. They examine how promissory narratives about the large-scale potential of biochar, alongside the development of socio-technical devices such as monitoring, reporting, and verification (MRV) infrastructures, come together to create a pathway for biochar as a viable market actor. Through this lens, they show how tools from social studies of finance and science and technology studies can complement cultural political economy in the study of mitigation deterrence. Notably, in their study Price et al. find that there is currently no government-recognised pathway for biochar methodologies, which makes an integration into other ‘nature’ or carbon markets difficult. To address this, a coalition of actors including the British Standards Institution (BSI) as the national standards body of the UK is working to fill the regulatory gap by developing standards, expected to be delivered by 2026. This ongoing process highlights the critical role of standardisation across different market-schemes, enabling entities to be structured by legally and technically defined characteristics, ultimately facilitating their allocation and trade. Price et al. (2024) further reference the CRCF as a comparable, supranational process at the EU level, proposing that future research should examine and compare different implementations of carbon marketisation processes across national contexts and for various CDR solutions.

As I have suggested, my aim is to situate current efforts to establish markets for carbon removal as both innovative and a continuation of a longer history of carbon markets in the European Union (e.g. Braun, 2009; Bryant, 2016; Michaelowa et al., 2019, Laurent, 2022; Doganova & Laurent, 2019). European carbon markets exemplify what Frankel et al. (2019) have termed ‘markets for collective concerns’, in the sense that they need to be understood as distinct instruments of policy making that require continuous ‘repair’ for their effective operation.

Even though the debate on the issue of carbon removal has only really picked up speed in recent years, there is extensive work that has in similar ways explored the commodification of carbon and the emergence of carbon markets to regulate and trade emissions alongside the emergence or development of new technologies, standards and accounting procedures. By examining these discussions, I argue we gain valuable insights into how novel *agencements* (Callon, 2007) are being assembled to incorporate carbon removal into existing market frameworks.

Essentially, this includes the emergent actor-networks and practices of engagement in marketisation process. I believe there might be some intersections with yet another field of study that I would like to introduce in the third chapter of the state of the art.

2.5. Public Engagement in Carbon Removal: Research Perspectives and Challenges

In recent years, Science and Technology Studies (STS) have shifted from normative and methodological preoccupations towards more descriptive accounts of participation and engagement as they unfold in practice. While 'realist' accounts of participation (Kearns & Chilvers, 2019), especially those rooted in Habermasian traditions, often treat participation as a neutral forum for deliberation, STS increasingly considers participatory formats as *technologies* in themselves – tools that move across contexts, adapting to and shaping diverse cultural norms of deliberation and democracy.

This shift invites us to explore participation as an empirical phenomenon in its own right, scrutinising how engagement is operationalised across various settings and thus embedded within particular democratic and deliberative norms. Ironically, participatory procedures initially designed to counter technocratic decision-making have inadvertently fostered new forms of trans-local expertise. Such expertise, as Voß and Amelung (2016) observe, establishes new epistemic authorities, shaping specific modes and standards for public participation.

Adopting a co-productive approach in this analysis allows us to view often-invoked entities – such as the public, issues, and democracy – not as fixed concepts but as dynamic elements co-constructed within participatory moments and processes (Law, 2009). For instance, mini-public forums may aim to involve an idealised 'public', yet the process of becoming this public entails complex negotiations, with participants navigating imposed or rejected identities – efforts that do not always succeed in aligning ideals with practical outcomes (Lezaun & Soneryd, 2007).

Felt and Fochler (2010) provide further insight by emphasising how public engagement settings act as political machineries that frame specific roles and identities for participants vis-à-

vis 'the public at large'. Simultaneously, these settings allow participants to appropriate and redefine these roles, constructing themselves and their collective identities in relation to broader publics.

In examining the emerging practices and actor-networks involved in the marketisation of carbon removal, this framework guides us to look beyond normative commitments to public participation and instead to consider what participation actually *does* – both in specific instances and as part of larger socio-political processes.

Recent studies on CDR employing more realist approaches are examining social acceptance for individual removal technologies by focusing, e.g. on specific criteria for enhancing support towards 'novel' CDR solutions in the UK (Cox et al., 2024), outreach and participatory strategies in the context of an in-situ experimentation of coastal enhanced weathering in the Dominican Republic (Hilser et al., 2024), framing effects or stakeholder perspectives on public support for Direct Air Capture in the U.S. (Sloot & Bostrom, 2024) or biomass-based CDR in Germany (Otto & Matzner, 2024). These studies largely frame public engagement as a pathway to social license. My analysis aims to move beyond these prescriptive frameworks, instead exploring how recent studies that adopt more co-productionist or pragmatist approaches also highlight the importance of framing in shaping public perceptions and acceptance of various technologies.

Instead of merely assessing the success of different framings for enhancing acceptance across regional contexts or specific technologies, Waller et al. (2023a) emphasise the “pre-dominance of cross-cutting techno-economic expertise” and argue that “framings of CDR as a solution to governing climate change may contribute to public disengagement from climate policy processes” (p. 35). Furthermore, they find that, overall, the distinctions between different CDR solutions into 'natural' and 'engineered' CDR are used quite flexibly by actors in practice, suggesting that the categories used by researchers to elicit attitudes or positions may not map neatly onto actors' engagement. Similarly, Osaka et al. (2021) critique the framing of nature-based solutions as “natural”, arguing that this label often obscures the inherent risks and technocratic characteristics associated with such solutions. Both studies underscore the necessity for more nuanced discussions around the framing of CDR technologies, as these frames significantly impact public engagement and support.

The interpretive complexity surrounding public engagement with CDR technologies is another critical theme emerging from the literature. Sovacool et al. (2024) emphasise the interpretive flexibility of negative emissions and solar geoengineering technologies, noting that different social groups attach varied meanings to them, which influences public acceptance and legitimacy. Complementing this, Waller et al. (2023b) propose a framework that

distinguishes between “procedural” and “performative” approaches to public perceptions, advocating for a deeper exploration of conflicting expectations that arise during CDR demonstrations. Healey et al. (2024) further contribute to this discourse by suggesting a responsible innovation framework, stressing the need to evaluate CDR technologies within their specific sociopolitical contexts and to consider the diverse values and interests at play in policy design.

Not yet for CDR, but for the related concept of net-zero, recent studies have tried to capture the emergence of new publics and counter-publics around net-zero commitments. Valenzuela and Lezaun (2024) explore how ambiguous net-zero pledges foster a collective consideration of consequences, thus broadening the range of actors involved in debates over climate futures. The concept of net-zero would thus be an instrument of problematisation, defining a specific future end-state and revealing material interdependencies among actors affected by the pursuit of that goal.

In contrast, Paterson et al. (2023) introduce the concept of “anti-net zero populism”, analysing how counter-movements in the UK utilise discourse to undermine established climate policies. In the case of the formation of parliamentarian groups in the UK, they show how particular ‘discursive opportunity structures’ available to those emergent actor groups have shaped the way they combine technical and political critiques of climate policy in efforts to both politicise elements of net zero policy and depoliticise suggestions for energy policy. Their analysis concludes that climate policy would benefit from engaging with economic and cultural grievances, through either policy designs or consultation processes, to reduce risks of deep public and political backlashes. Together, these studies illustrate the dynamic interplay between the emergence of novel concepts in the climate policy landscape and the enactment of novel publics.

These themes collectively underscore a shift towards understanding public engagement in CDR not merely as a mechanism for achieving social license but as a complex interplay of framing, emerging publics, and interpretive dynamics. By examining how publics are enacted and the multifaceted nature of their engagement, this relatively small body of literature paves the way for a more comprehensive approach to studying participation and engagement with the issue of CDR, recognising the ways in which CDR is enacted as an issue and what publics might emerge.

2.6. Interim Conclusion

Taking stock of the existing literature, several insights emerge that can inform this investigation into CDR regulation, along with notable research gaps and invitations for further exploration. First, the literature from a knowledge-sociological perspective reveals how

contingent – and influential – the categorisation of CDR and geoengineering concepts has been in shaping scientific and political discourse. This categorisation process remains dynamic and contested, as various stakeholders continue to define and negotiate the boundaries of what CDR entails. Thus, a central aim for this study is to analyse the classificatory regime through which CDR is sought to be enacted within the evolving context of European regulation.

Secondly, the literature highlights the importance of regulatory infrastructures in scaling CDR efforts. Specifically, as noted, many studies emphasise the role of evaluation infrastructures for removal activities and the integration of CDR into existing climate policies. From an STS perspective, however, this research focuses less on the preconditions for effective implementation and more on the socio-material conditions that enable the emergence of CDR as a regulated field within the EU. By examining how regulatory processes and evaluative frameworks are assembled, we can gain insight into how CDR is being made actionable within a highly complex political and scientific landscape.

Market formation for CDR is another area where the literature offers valuable insights, particularly around carbon markets and public trust infrastructures. However, it remains an open question whether and how the CRCF structures CDR within a market-oriented or otherwise financialised reward mechanism. Drawing from social studies of markets, this research will explore whether CDR is being framed as a market-in-the-making, or alternatively, as a domain requiring other forms of governance. This includes examining devices such as standards and quality certifications that could serve as trust infrastructures, shaping public perception and acceptance of CDR as a legitimate climate response.

An additional theme arising from the literature is to focus on the formation of “concerned groups” (Callon & Rabeharisoa, 2003) that emerge in response to the publicisation of techno-scientific phenomena. By treating the CRCF as a site of enactment of such publics, the approach of my thesis aligns with co-productive and pragmatist perspectives, moving beyond normative evaluations of public engagement. Instead, it examines how participation operates in practice, uncovering the socio-political dynamics that underlie the consultation process and its implications for carbon removal governance.

Recent shifts in STS and participatory studies provide a compelling framework for examining the CRCF regulatory process as a site where public engagement is enacted. Participation is no longer viewed as a neutral forum for deliberation but as a dynamic technology that adapts to and shapes sociopolitical contexts. This perspective allows us to consider the CRCF consultation process as more than a procedural mechanism; it becomes a space where roles, identities, and public authority are actively negotiated and co-produced.

Building on the existing literature about the emergence of publics in techno-scientific controversies, this thesis will explore how formal consultations and informal discourses within the CRCF invite diverse stakeholders to engage with carbon removal as a socio-technical issue. These publics are not pre-existing entities but often emerge through participatory formats and mechanisms, bringing to the fore the interpretive flexibility of CDR technologies and the complex interplay of interests, norms, and expertise within regulatory processes.

The following steps will involve an attempt to further elaborate upon these findings by developing a theoretical framework for my thesis. By building on perspectives from social studies of markets, actor-network theory (ANT), performative economics and pragmatist insights into issue formation, the aim is to capture the complex socio-political processes that shape the regulatory landscape of CDR and contribute to the understanding of public engagement with the marketisation of emerging climate technologies..

3. Sensitising Concepts

In this chapter, I will engage with theoretical frameworks that will inform my analysis of carbon marketisation and the knowledge politics surrounding the concept of carbon dioxide removal (CDR). Having reviewed the interdisciplinary social science literature that addresses these topics, it is now necessary to clarify the theoretical standpoint from which I approach my empirical material. This requires an explanation of the intellectual traditions and perspectives that underpin my approach.

I will begin by situating my approach within the broader fields of actor-network theory (ANT) and the performativity program (e.g. Callon, 1998; Callon & Muniesa, 2005; Cochoy, 2008). Following this, I will critically engage with theoretical perspectives that emphasise politics as a socio-material practice – an aspect often overlooked in ANT scholarship. This discussion will provide a stronger theoretical grounding for addressing the political dimensions of my empirical material and contribute to a more nuanced understanding of the intersections between markets, politics, and materiality.

3.1. Actor Network Theory

ANT is not a unified theoretical framework but rather a set of sensitising concepts and guiding principles. Rooted in the early laboratory studies (Latour & Woolgar, 1979), ANT has significantly shaped research into the social construction of scientific knowledge. Since then, it has extended its analytical reach to diverse fields, including organisational studies, market dynamics, infrastructure development, and policy-making. By decentering traditional notions of agency and focusing on the interactions between human and non-human actants, ANT provides insights into how power relations and sociotechnical order are enacted and stabilised within complex networks (Law & Callon, 1988).

According to ANT, social and technological entities are not to be separated. Rather, it views the technological and societal sphere as interconnected and co-constitutive, with the world being made up of 'sociotechnical hybrids' (Latour, 1994). The program would thus aim to dissolve these classical boundaries and include non-human actors into their analysis (Michael, 2017). The principle of generalised symmetry means that researchers would approach their object of research with the same analytical tools for both human and non-human actants (Callon et al., 2011).

True to a social constructivist tradition, ANT is less concerned with explaining the causes of a phenomenon, but rather with the question of *how* things are enacted or assembled – that means how things come into being, thereby focusing on the context of specific actor-networks, the relationships and circulations involved, and the ways in which a phenomenon is practiced

or performed. As it is concerned with the relationships between objects and meanings, the approach is also known as material-semiotic (Law, 2008).

3.1.1. Performative Economics 1x1

As previously noted, ANT has expanded its focus beyond the production of scientific facts, venturing into fields such as the analysis of economic markets. As discussed in the State of the Art, studies within STS have scrutinised socio-technical standardisation and marketisation of different natural phenomena. For example, these studies have examined how carbon as a socio-material entity is enacted through data practices and protocols in corporate environments (Lippert, 2015) or through systems of monitoring, measurement, and verification (Ehrenstein & Muniesa, 2013). Unlike disciplines such as political ecology, human geography, or related fields, these studies thus approach 'the climate', or 'the environment' not as pre-existing entities but as outcomes shaped by systems of standardisation and calculation.

This perspective aligns with the program of performative economics. Callon introduced the concept of 'performativity' in economic sociology to suggest that economics as a discipline is not so much a passive observer of the economy as it is an active participant in bringing it into being through various methods of performing, shaping and formatting. In *The Laws of the Market* (1998), Callon makes the first comprehensive attempt to de-essentialise organised markets through the concept of calculative agencies. From an ANT perspective, this means abandoning the notion of an impersonal market logic that imposes its structure on the world. Instead, Callon emphasises that markets are shaped by actors – economic agents and social scientists – who cannot be seen as detached or disinterested entities, "reduced to their preferences and calculative competencies" (Callon & Muniesa, 2005, p. 1230). Drawing on pragmatist ideas, this approach rejects viewing markets as either natural laws to be uncovered by scientists or mere social constructions invented to simplify complex realities.

Rather, markets represent patterns that are gradually established through the interplay of the economy and economics as a discipline. As the title of Callon's book hints, it would thus be wrong to assume a universal law of the market. Instead, there are multiple temporary and evolving laws associated with particular markets, limited in time and space. It also challenges the notion that individual humans are the sole decision-makers in the market. It suggests that organised markets are shaped by different forms and distributions of agent-networks, including both human and non-human actants such as models, graphs, and accounting tools – assemblages that Latour also coined calculative agencies (1987). The goal of the performative economics program is thus to explore how networks of different calculative tools and agents contribute to the stabilisation and transformation of these many-sided evolving devices.

3.1.2. Calculative Agencies in Action

In *The Laws of the Market* (1998), Callon addresses the question of how agents can make calculations in the absence of stable information or shared predictions about the future. Callon posits that the process of rendering relations visible and calculable necessitates considerable effort, entailing the delineation of roles, the formulation of metrics, and the construction of shared reference points. This resonates strongly with the challenges currently facing CDR, which is perceived to be hindered by uncertainties regarding its feasibility, scalability, and socio-economic impacts. In order for CDR to emerge and stabilise as a viable solution, it is essential that the inherent uncertainties associated with it are addressed. Only this will enable the transformation of CDR into a calculable and actionable domain.

By referencing Max Weber, Callon highlights the importance of accounting methods – a practice that has been vital to the development of modern capitalism (Weber [1992], 1978 in Callon, 1998, p. 23). However, he goes beyond Weber's perspective by asserting that accounting methods not only provide a basis for the emergence of concepts such as cost and profit, but also shape the relationship between *what* is being measured and the tools *used* for its measurement. This finding is consistent with the results of the initial laboratory studies, which demonstrated that scientific tools, particularly those employed in accounting, not only document reality but also exert a significant influence on it. These devices not only create spaces for calculability and determine how calculations are made, but also drive the development of new *calculative strategies* and changes in objectives. Neglecting the role of these tools would impede comprehension of how calculative agencies emerge and function, as all decisions are influenced by this complex calculating system.

In a later article by Callon & Muniesa (2005), the concept of calculation is elaborated upon. While many social sciences equate calculation with the rational abilities of individuals in performing mathematical or numerical operations, the authors argue from an anthropological perspective on technology and knowledge that “calculation starts by establishing distinctions between things or states of the world, and by imagining and estimating courses of action associated with those things or with those states as well as their consequences.” (p. 1231) They define this comprehensive definition as a three-step process that involves moving between detachment and reattachment:

For any market frame to emerge and stabilise, actors, interests, and goods must first be disentangled, thus defining what to include and what to exclude from consideration within that frame based on a common operating principle. This detachment or isolation of objects from their context and the preceding grouping is a necessary first step in order to ‘sort them out’ (Bowker & Star, 2000). Next, original relations are established between the entities ‘taken into

account', and they are associated with one another and subjected to manipulations and transformations, for example by displaying two entities and their evolution on the same device. Finally, a result is to be extracted out of this movement and, importantly, to leave the calculative space without bringing along the entire calculation apparatus.

This logic of translation, which is similarly inspired by the analysis of the social production of scientific facts (Latour & Woolgar, 1979), once again stresses the importance of material devices and spaces for the emergence of organised markets. Paying attention to the characteristics and practices that can be observed for one entity within different calculative spaces, would provide nuanced explanations for different forms of calculation. Ultimately, this also allows to emphasise the diversity of possible forms of market organisation: "Calculative agencies are as numerous and diverse as the tools they use and the hybrid collectives to which those tools belong." (Callon & Muniesa, 2005, p. 1245)

Seen in this way, if there are a variety of options for organising these calculating agencies, it is also possible to ask who has the power to effectively coordinate the arduous and costly activities required to stabilise and reconfigure these collective institutions. In addition, analysts of such calculative assemblages can examine which arrangements allow for calculation and which do not. It is important to note, however, that precisely these political dimensions of marketisation have not been thoroughly explored in ANT. As we shall see in the next section, the programme has struggled to develop a theoretical foundation for these political aspects.

3.1.3. Performativity as Political Practice

The political dimension of the performative economics program has long been a topic of discussion and controversy (Cochoy et al., 2008). Although it has highlighted the need for continuous adaptation and 'repair' from a range of agents in order to achieve effective outcomes in market-based systems, proponents of this tradition have held divergent views on the conceptualisation of political issues. This has already been demonstrated in the review of the literature on the politics of carbon markets, as presented in Section 2.3.

While there is a great deal that can be said about the intricate relationship between ANT and various aspects of politics, as well as the numerous revaluations that are often subsumed under the term Post-Actor-Network-Theory (Michael, 2017), it is more beneficial to take a step back and delve into the particular controversy surrounding the politics of carbon markets at this juncture.

The aforementioned analysis of 'Carbon Marketisation and Performativity as Politics' by Blok (2011) offers a valuable insight into the diverse approaches employed by various authors in the study of the politics of carbon markets. Consequently, the paper can be regarded as a direct response to MacKenzie's work on carbon marketisation (e.g. 2007; 2009a; 2009b), as

well as that of other authors such as Lohmann (2005) or Callon (2009), who all work within the tradition of ANT and have explicitly or implicitly addressed the role of politics in researching processes of carbon marketisation.

In short, Blok (2011) observes that carbon market analysts adopt divergent stances on carbon marketisation: some, like Lohmann (2005), critique it as a technocratic imposition that exacerbates global inequalities and depoliticises climate change debates; others, like MacKenzie (2009b), take a 'de-essentialised' or cautiously optimistic view, framing marketisation as an outcome of practical attitudes; and still others, such as Callon (2009), see it as the groundwork for developing 'civilised' markets. Notably, while all three scholars draw from the theoretical framework of ANT and employ the vocabulary of performative economics, their use of these concepts varies significantly, leading to distinct interpretations of carbon markets and their implications.

This divergence is not only about empirical findings but also reveals differing visions for especially the role of social scientists in relation to carbon markets. Lohmann's (2005) approach positions social scientists as critical agents who must expose inequalities and resist the depoliticisation of climate issues. In contrast, MacKenzie (2009b) emphasizes a more managerial role, analysing and potentially improving the mechanics of markets and dismissing critique as political *attitudes*. Callon (2009), on the other hand, envisions a more participatory role, where social scientists contribute to the refinement of *civilised markets* by facilitating deliberative and inclusive processes.

However, the ways in which they derive these stances remain ambiguously articulated, reflecting a broader absence of robust theoretical foundations of this political dimension. This vagueness leaves the relationship between politics and carbon marketisation undefined, raising critical questions about how politics should be understood and enacted within these frameworks.

At this point, Blok suggests that the program of performative economics could benefit from recognising politics itself as a dynamic interplay of collective actors, contestation sites, and witnessing technologies. In conceptualising politics as a performative set of material-symbolic practices (e.g. Latour, 2007; Marres, 2007), he attempts to examine the political spaces of civic participation to which marketisation in general and carbon marketisation in particular give rise. To this end, he proposes to examine the role of different environmental NGOs that, in the context of carbon marketisation, integrate climate change and techno-economic knowledge with political forms of action and intervention. Using three ideal-typical configurations ('consuming', 'engaging' and 'confronting') of NGO co-performances, he additionally mobilises resources of public engagement in science research.

What deems crucial therefore, and what shall be the last part of this section, is a theoretical exploration of viewing politics as a set of material-symbolic practices.

3.2. Public Engagement in Science and Technology

To better understand the political dimensions of markets-in-the-making, I propose framing them in practical terms as a question of public involvement. This shift in focus necessarily moves us into a different theoretical territory, requiring a few words of caution: Within STS, there is a long and lively debate on public involvement in science and technology (cf. Hagendijk & Irwin, 2006; Pallett & Chilvers, 2013), particularly through the programs of public ‘understanding of science’ (PUS) and ‘public engagement in science’ (PES). These discussions reflect broader disputes about the aims of science communication, the role of the public in scientific discourse, and the vision of a ‘scientifically literate society’. Such debates resurface repeatedly in discussions about the relationship between science and society, as evidenced in the work of carbon market theorists.

Important for me to note is then that proponents of both, the so-called ‘deficit model’, which is attributed with PUS and the ‘dialogue model’, which is related to PES scholars both have their shortcomings in terms of their understanding of publics. While the deficit model is critiqued for its simplistic and paternalistic view of publics as passive recipients of knowledge (Wynne, 1992a), the dialogue model of science-society relationship can be critiqued for its tokenistic use of or calls for more ‘effective’ or ‘inclusive’ participatory elements (Chilvers & Kearnes, 2020). It thus shall be the focus of this chapter to re-visit some of the conceptual foundations of studying public involvement in science and technology to later mobilise these insights for my analysis of public involvement in processes of marketisation.

My approach builds on Blok’s (2011) conceptual sketch, drawing primarily on Marres (2007) to inform and sensitise this study. Marres’ work provides a significant theoretical pathway for understanding the interplay between techno-scientific controversies and public engagement. Her analysis challenges the limitations of earlier science-society debates by shifting focus toward the issues themselves, emphasising their capacity to organise democratic engagement.

Marres’ intervention can be seen as a response to the broader crisis of public confidence in scientific and technological decision-making during the early 2000s. This period was marked by high-profile controversies – such as those surrounding GMOs, climate change, and biomedical research – that catalysed demands for greater public involvement in scientific governance. Against this backdrop, governmental initiatives increasingly sought to democratise the relationship between science and society, often through the establishment of participatory mechanisms like citizen juries, consensus conferences, and advisory boards.

While many of these initiatives were shaped by deliberative democracy theories, which prioritised inclusive, rational, and consensus-driven dialogue, Marres critically interrogates their assumptions by incorporating antagonistic democratic theories and insights from STS.

STS scholars, including Marres, viewed these developments as an opportunity to question traditional understandings of the science-society relationship. They posed new inquiries: How does a novel artefact create concerns for different kinds of publics? In what ways are technoscientific objects connected to specific discursive frames but not others? What kinds of institutional arrangements are enacted to govern or transform such controversies?

3.2.1. Politics as a Socio-Material Practice

It is exactly in this situation that Marres demands 'the issue deserves more credit' (2007). She critiques deliberative theories that primarily focus on procedural events and discursive dimensions of issue formation, arguing that these approaches overlook the socio-material practices involved in making issues public.

Traditionally, social science and democratic theory emphasised public participation in institutional politics as the main driver of issue visibility, often relying on discursive tools like Goffman's (1974) concept of the 'frame', which highlights how the structuring of perception shapes the understanding and prioritisation of issues in public discourse. While useful for understanding how public concerns are shaped, frames often treat issues as external and stable, something that actors would simply pick and choose from an existing discursive bouquet. Failing to capture the practices and material entanglements through which issues become public, Marres (2007) introduces the concept of "attachment" (p. 774) to emphasise how actors are implicated through their dependencies and commitments within these associations, offering a more nuanced understanding of public engagement. This focus on attachments foregrounds a socio-ontological perspective of public involvement that Marres identifies within STS.

According to this perspective, differing views on technoscientific controversies are not merely varied points of view or 'preferred ways of knowing', but often incommensurable 'ways of being', deeply embedded in material entanglements. Understanding what is at stake in such controversies, therefore, requires attention to how these processes intervene in collective lifeworlds composed of both social and material elements.

For instance, she refers to Bryan Wynne's (1992b) well-known study of North-Cumbrian sheep farmers, whose lifeworlds – including their sheep, land, and livelihoods – were deeply implicated in debates about radioactive fallout following the Chernobyl disaster. She also highlights Michael and Brown's (2005) analysis of the xenotransplantation controversy, where focus group participants enacted specific issues by articulating them through their personal

and material associations. These studies illustrate how individuals justify and explain their concerns by drawing on the socio-material contexts in which they are embedded.

By revisiting the “Lippmann-Dewey debate” (e.g., Lippmann, [1925] 2017; Dewey, [1927] 1991), Marres (2007) draws on pragmatist philosophy to conceptualise practices of issue formation as a central element of democratic processes. The debate between Lippmann and Dewey in early 20th-century United States was rooted in their shared recognition of the increasing prevalence of technology in society, which fundamentally altered the conditions under which various groups engage in politics. Both thinkers, like later proponents of ecological modernity, highlighted the growing complexity of societal affairs in an industrialised world and the amplification of their effects and consequences through new media, such as newspapers, radio, and cinema.

Lippmann and Dewey both observed that public involvement arises most often when existing institutions fail to address the consequences of social or technological change. In such instances, “issues appear as an organising principle of the public” (Marres, 2007, p. 769). These moments, characterised by a lack of institutional closure, allow publics to form around unresolved controversies, as individuals and collectives come together to articulate and navigate emerging issues that existing structures are unable to contain.

Thinking with the pragmatists thus offers practical insights for studying technoscientific controversies and practices of issue formation. Their approach broadens the scope of analysis to include a wider range of practices and formats, extending beyond the procedural events typically associated with public participation. Pragmatists place particular value on situations of procedural underdetermination – moments where insufficient institutional support exists to resolve a political discussion. Such situations are considered analytically valuable because they allow for a deeper examination of how issues are defined and articulated.

Resolving public issues requires engagement from outside established institutional frameworks, which makes it essential to differentiate between “publicising” (inviting scrutiny) and “de-publicising” (obscuring scrutiny) articulations. Therefore, pragmatists argue that the characteristics of contested issues and the ways in which they are publicly articulated must be closely examined.

3.3. Interim Conclusion

Building on the discussion of the State of the Art (Section 2.), this chapter has aimed to deepen key theoretical concepts and sensibilities relevant to the analysis. The content is structured into two main sections: the first (3.1) explores the ANT-inspired conceptualisation of markets as dynamic, processual, and socially constructed phenomena, while the second (3.2) theorises public involvement in science and technology as a socio-material practice. Together,

these sections establish a robust theoretical foundation for analysing the case of the Carbon Removals and Carbon Farming Certification Framework (CRCF).

Following Blok's (2011) approach, this chapter demonstrates how the performativity programme, which examines markets-in-the-making, can be meaningfully integrated with a nuanced understanding of the politics of techno-science. This integration provides a framework for empirically addressing the complex (sub-)political processes involved in market formation within the context of climate change. As Blok (2011) highlights:

“Mirroring how climate change issues are more generally implicating publics in new practices of climatic citizenship across the lay-expert divide (e.g. Marres, 2009), environmental NGOs come to embody new forms of techno-economic citizenship in practices of witnessing and interfering with carbon marketisation.” (p. 461)

This theoretical synthesis allows for a comprehensive engagement with the ways in which public actors, such as NGOs, shape and contest the socio-material processes underpinning marketisation in response to climate change. Building on this synthesis, my analysis will focus on the CRCF and, in particular, its modalities to enact and stabilise different calculative agencies. This leads me to include the consultation process as a distinct socio-technical arrangement, exploring how public involvement is actively shaped through selective framing of issues. The CRCF consultation process provides an opportunity to explore how ‘public’ statements are solicited and how the framing of issues might shape the scope of public involvement. By examining this process, we can consider how the institutional process potentially defines what is open to scrutiny and what may be obscured. This perspective invites us to view the consultation not merely as a procedural step, but as a mechanism that could play a role in shaping how public engagement, visibility, and critique are managed within the broader socio-material processes of market formation.

4. Research Questions

In the preceding sections, I have reviewed the state of the art relevant to my case and examined the theoretical frameworks underpinning my analysis. Current research identifies the standardisation and certification of removals as critical bottlenecks for the deployment and scaling of carbon dioxide removal (CDR). However, there has been limited focus on the practical implications of these processes. One notable contribution is Brad and Schneider's (2023) analysis of the Carbon Removals and Carbon Farming Framework (CRCF) from a historical materialist policy perspective. Their study raises important concerns about the potential for mitigation deterrence due to the potential use of removal credits as offsetting instruments.

Nevertheless, this perspective only captures a partial aspect of the overall process. While it offers valuable insights into the implications of leaving the door open for offsetting, it lacks an in-depth analysis of how the marketisation of CDR is being operationalised in the first place. To address this gap, my study delves into the regulatory documents and the mechanisms behind the CRCF to investigate how the marketisation of CDR is enacted in practice. This focus is particularly relevant given that, as prior research on the market integration of carbon commodities and technologies has shown, framing climate change mitigation as a question of market design involves complex socio-material processes that warrant further examination. Specifically, understanding the translation of socio-material practices into market devices offers crucial insights into how the standardisation of removals might shape emerging carbon removal markets.

To guide my research, I have formulated an overarching research question and three sub-questions. Following on from my theoretical discussion of the performativity program and the ways in which specific socio-material practices shape the outcome of regulatory processes and their implications for market formation, my research question reads as follows:

RQ: *How does the European regulatory process of the CRCF transform carbon dioxide removal into a market object?*

My interest lies not in analysing the conditions for a potentially "successful outcome" of policy implementation, nor in deriving definitive conclusions about the potential for mitigation deterrence. Rather, I focus on critically examining how the technoscientific controversy surrounding CDR is translated into an organisational problem within the European climate policy landscape. Specifically, I aim to understand how networks of calculative tools and agents contribute to the stabilisation and transformation of CDR into a market object (Callon & Muniesa, 2005). To operationalise this, I divide my overarching research question into three sub-questions.

SQ1: *How is carbon removal framed and constructed as a market issue across key policy documents of the European Commission?*

For the first sub-question, I examine how carbon removal is conceptualised within European policymaking and progressively framed as a matter of market design. This involves establishing specific problem framings, integrating carbon removal into broader policy landscapes, and formulating devices and strategies to address the diagnosed challenges. As Laurent and Doganova (2020) argue, such processes of 'carving out a domain for a market' requires extensive socio-material and institutional work to operationalise this framing.

Moreover, for a market frame to emerge and stabilise, actors, interests, and goods must undergo processes of detachment and reattachment (Callon & Muniesa, 2005). In the context of the CRCF, this involves determining which removal "solutions" to include amid uncertainties surrounding their potential, scalability, and side effects. Similar to MacKenzie's (2009) analysis of "making gases the same," creating a market for carbon removals necessitates rendering diverse solutions equivalent enough to be incorporated into a unified certification framework. Investigating how this detachment and reattachment process is operationalised sheds light on how market frames are constructed through the "sorting out" of socio-material relations (Bowker & Star, 2000). Notably, this process includes not only the objects of regulation but also the actors involved.

Market creation also entails the anticipation, consultation, and active construction of a public or collective toward which the market is directed (Frankel et al., 2019). In the CRCF, multiple consultation strategies align the certification framework with the interests of various actor groups. This raises questions about how notions of stakeholders or "publics" are enacted to stabilise the market frame for carbon removal.

Following my theoretical framework, I analyse the assessment of various removal solutions and certification mechanisms, along with the external consultation process within the Call for Evidence. These elements are examined as market devices that attempt to stabilise the market frame through key regulatory documents, such as the Proposal for a Regulation (European Commission, 2022e) and its Impact Assessment (European Commission, 2022c; -2022d).

SQ2: *How do assessment reports and public consultations function as market devices in the development of the CRCF?*

The third sub-question extends my inquiry into the consultation phase, focusing on the role of politics in market construction. As discussed in Section 2.5. and further elaborated in Section 3.1.3., previous studies on (carbon) marketisation have approached the role of politics differently. Among the actors studied, however, NGOs stand out as an actor group that has been observed to take part in the enactment (e.g. Braun, 2009), the maintenance (Ehrenstein,

2022) and the contestation (e.g. Blok, 2011) of carbon markets. Building on Blok's insights, my thesis explores this dynamic within the context of CDR marketisation, not to provide a "realist" account of *who* is involved or their detailed positions but to understand *how* the market frame itself becomes a site of contestation.

I aim to examine the mechanics of the Call for Evidence, focusing on its design, the contributions from various NGOs, and how these are integrated into the subsequent Impact Assessment (European Commission, 2022c; -2022d). Through this analysis, I seek to understand how NGOs engage with and contest the marketisation process, as well as how institutional procedures incorporate and navigate these contributions within their documentation.

SQ3: *How do Non-Governmental Organisations engage with the CRCF by contesting CDR as a market-in-the-making?*

Through this comprehensive approach, I seek to contribute to what I term the "performative struggles" surrounding the standardisation of CDR and the engagement processes within the CRCF.

5. Research Field, Data and Methods of Data Collection

One challenge inherent to actor-network theory (ANT)-inspired research is the decision-making process regarding the delineation of the respective network. The field of European climate and industrial policy is broad and complex. Nevertheless, even when examining the specific project of integrating carbon dioxide removal (CDR) into this landscape, one encounters a vast quantity of documents originating from disparate policy domains. These include hybrid discussion events, expert group meetings, press releases, and even discussions on social media. Consequently, a variety of methods could be employed to examine how individual ideas or concepts are evolving within the corridors of Brussels and beyond.

It is therefore crucial to provide a clear definition of the research field, and the approach adopted in examining the material. The following chapter aims to offer transparency regarding the selection process and the data collection methodology.

To this end, the chapter is divided into two parts. The first section provides insight into the criteria used to select the documents analysed, while the second outlines the procedures employed in gathering data on NGO engagement and the sampling process.

5.1. The Policy Assemblage

As previously stated, the Carbon Removals and Carbon Farming Certification Framework (CRCF) represents the key focus of my investigation into the standardisation processes of CDR within the context of European climate policy. The project, which has acquired a degree of recognition as an acronym and is treated as a standalone framework, was initiated by a series of strategy documents and is not solely the concluding proposal. Rather, it comprises multiple documents. In order to trace the formation of this concept, I will thus include preceding documents, such as the Circular Economy Action Plan (CEAP) (European Commission, 2020a), the Farm to Fork Strategy (European Commission, 2020b) as well as the Sustainable Carbon Cycles Communication (European Commission, 2021a), in my analysis. The documents will be examined primarily to explore the manner in which the concept of carbon removal is introduced into European policymaking and subsequently transformed into a matter of market design.

Following an examination of the chain of documents that have led to the formulation of the CRCF as a project, I will make an attempt to disentangle the final proposal by considering few documents that are crucial in how this regulatory project was constituted. These include external review reports, one on the assessment of different removal solutions (Bey et al., 2021) and one on different certification mechanisms already used to certify CDR activities (McDonald et al., 2021).

Furthermore, the consortium responsible for the production of these reports (comprising the Environment Agency Austria, the Ecologic Institute, Ramboll Consulting and Carbon Counts) was also instrumental in the implementation of a range of consultation strategies, including the Call for Evidence. As previously outlined, the Call for Evidence plays a role in this process, and as such, its development is also under review in relation to the implementation of market devices. In particular, an examination was conducted of the Call for Evidence, which comprises the initial questionnaire (Annex 11.2.), the statement of the “Call for Evidence for an Impact Assessment” document (European Commission, 2022a), which sets out its strategy and goals, and the Summary Report (European Commission, 2022b).

The two assessment reports, along with the pertinent documentation associated with the Call for Evidence, were ultimately subjected to a comparative analysis in light of their integration into the Impact Assessment (European Commission, 2022c; European Commission 2022d). The following table presents a comprehensive list of policy documents utilised for the analysis of the regulatory project.

Table 1. Core Set of policy documents and reports regarding the CRCF

Title	Document Type	Published
A new Circular Economy Action Plan For a cleaner and more competitive Europe	Communication – COM(2020) 98	11.03.2020
A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system	Communication – COM(2020) 381	20.05.2020
Sustainable Carbon Cycles	Communication – COM(2021) 800	15.12.2021
Certification of Carbon Removals. Part 1: Synoptic review of carbon removal solutions	Assessment Report	31.12.2021
Certification of Carbon Removals. Part 2: A review of carbon removal certification mechanisms and methodologies	Assessment Report	31.12.2021
Call for Evidence for an Impact Assessment	Preparatory Document for an Impact Assessment – Ref. Ares(2022)869812	7.2.2022
Summary Report on the Open Public Consultation on the Certification of Carbon Removals – EU Rules	Summary of Contributions to the Public Consultation – Ref.. Ares(2022)4684259	27.6.2022

Part 1 Impact Assessment Report. Accompanying the document Proposal for a Regulation of the European Parliament and of the Council establishing a Union certification framework for carbon removals	Staff Working Document(2022) 377	30.11.2022
Part 2 Impact Assessment Report Accompanying the document Proposal for a Regulation of the European Parliament and of the Council establishing a Union certification framework for carbon removals	Staff Working Document – SWD (2022) 377	30.11.2022
Proposal for a Regulation of the European Parliament and of the Council establishing a Union certification framework for carbon removals	Proposal for a Regulation – COM(2022) 672. 2022/0394 (COD)	30.11.2022

5.2. Engagement with the Market-in-the-Making

To identify points of contact for NGO engagement with the regulation in action, I examined the consultation process initiated by the European Commission and implemented by the external consortium that was just mentioned in the section before. To be precise, two rounds of external stakeholder engagement were conducted: the Call for Evidence, aimed at supporting the drafting of the Impact Assessment, held from 07 February to 02 May 2022, and an Open Consultation, which ran from 01 December 2022 to 23 March 2023, following the adoption of the proposal. Both consultations are accessible via the European Commission's "Have Your Say" website (European Commission, n.d.-b). Given my focus on the genesis of the framework and the intervention of NGOs into the ongoing regulatory process, I decided to concentrate on the first consultation, the Call for Evidence.

The "Call for Evidence" comprised a survey including the opportunity to answer a total of 11 multiple choice questions on the design of the regulation as well as to leave remarks in an open text column as well as upload more extensive individual position papers as PDFs. An Excel file with all the individual entries to the survey and a folder with all the PDF files of the position papers could be accessed as a download on the EUCOM's website. A total of 396 valid replies were received.

5.2.1. Data Conversion & Sampling

The initial data collection of responses to the Call for Evidence required the sampling of statements from NGOs and also some further modifications. Since the Call for Evidence invited responses from members of all European member states, the contributions to the survey as well as the individual position papers were often written in the respective domestic language of the authors. I used Excel's integrated translation function to translate the contributions into

English and then checked the results with the software DeepL in case of comprehension problems.

I must note that for one case of the sampling of the Call for Evidence the website of the European Commission does not show a PDF, though the organisation noted in its entry that a more detailed report would be attached (Carbon Gap, Annex 11.3., Ref. 34). Unfortunately, the organisation did not react to my inquiry on providing the report it had intended to upload.

From the initial 396 valid replies I sampled 27 contributions from NGOs. The actors include indeed a broad range of organisations, ranging from rather technocratic NGOs such as *Carbon Market Watch* or the *Environmental Coalition for Standards* to agriculture and farming organisations such as *La Via Campesina*, *Wetlands* or *Fern* to only name a few. The detail or length of their accounts differs greatly, some actors which just have left a few paragraphs as well as a few, which have attached extensive position papers.

However, I also encountered some of the difficulties in classifying these actors. The Call for Evidence form asked contributors to assert themselves to a specific actor category. Using the parameters 'Non-Governmental Organisations (NGOs)' and 'Environmental Groups' as a first prompt for sampling the material, this turned out to be very messy as there were suddenly some organisations, one of which was a Spanish oil company, that had contributed to the call as under the category of an NGO. *La Via Campesina*, as I discovered shortly after, asserted themselves as a business company. I just wanted to shortly flag this, because these 'errors in classification' somehow also resonated with one critique put forth by a collective of some NGOs which publicly criticised the DG CLIMA in June 2023 for the ways that the expert commission of the CRCF had been set up (Carbon Market Watch, Bellona Europa, European Environmental Bureau, ECOS, & fern, 2023).

Signed by Carbon Market Watch, Bellona Europe, the European Environmental Bureau and the Environmental Coalition on Standards (ECOS), the letter objected to the fact that the underrepresentation of NGOs in the expert group accompanying the regulatory process is camouflaged by several organisations with clear commercial interests having received the NGO label. Even if such errors were tried to be excluded by the set definitions of different actor groups given in the "Call for Experts" (European Commission, 2022g). In addition, the open letter the consortium as well as the distortion in represented interests during the group meeting, overtly relying on industrial speakers in favor of academic or civil society interventions².

Without wanting to jump to quick conclusions about the motives for the observed 'errors' in self-classification in the data sample, I believe, this is a telling example of the politics that are

² Moreover, the letter also critiqued the established expert group of the CRCF for the missing gender-balance.

inherent to the establishment of different actor categories as well as the strategies of actors to either adhere or break with the script. Thus, it highlights the importance of analysing the design phase of such forms of participation in more detail.

Ultimately, after also excluding 6 such organisations that legally also run as an NGO but rather represent interests of business or trade associations, such as the *Austrian Biomass Carbonisation Society (OEBIKA)*, the *Waldbauernverband NRW e. V.*, or *Sdružení vlastníků obecních, soukromých a církevních lesů v ČR*, the Czech forest owner's association, I finally collected 26 original statements. From these contributions there were 20 further position papers as additional PDF documents. Meaning that not every organisation attached a position paper, simply contributing to the survey or providing additional remarks in the comment section. The following flow chart in Figure 1 visualises the sampling process of the data for the Call for Evidence. A table that comprises an overview of the material can be found in Annex 11.3.

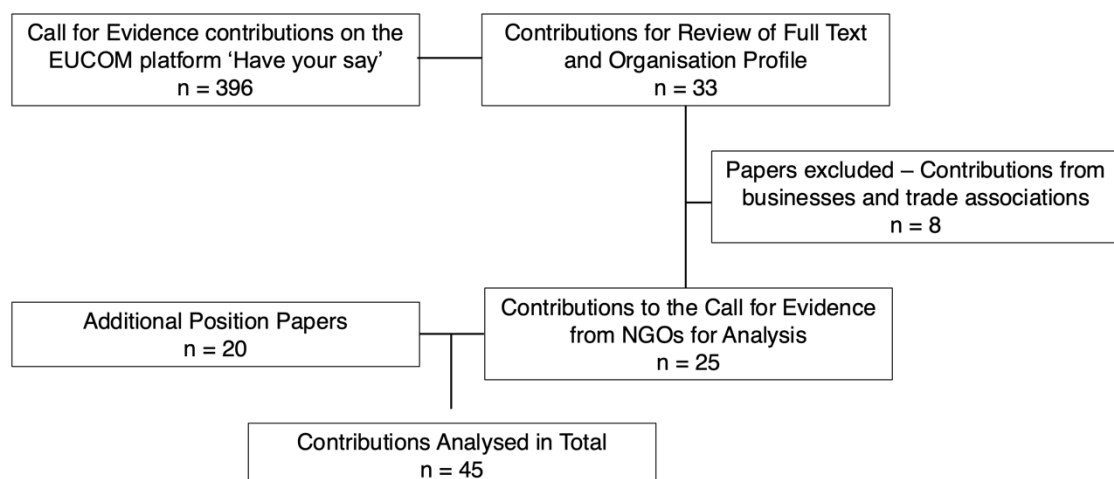


Figure 1 Flowchart of the Systematic Review Process.

6. Methods

As we are heading closer to analysing the specific case of this thesis, I owe a more thorough explanation of which methods I use for my research design. As indicated earlier, I am going to study the regulatory work of the CRCF by mainly looking the documents that enact the issue of CDR in the context of European policymaking. Certainly, there would be different ways to go about analysing this material. A classic way to look at documents in social science is to approach them via a discourse analysis, looking at the ways in which language is used to construct, reinforce, or challenge specific issues in a text. Paying attention to the specific narratives, concepts, and linguistic choices, which shape the perception of reality within the written accounts of the European Commission as well as the numerous NGOs will also play an important part in my analysis. Other than a classic discourse analysis, however, I will try to additionally pay attention to the material effects and transformations that the documents *do* the specific issue of CDR. Rather than looking at documents as passive objects or container of information, I want to approach them as quite lively agents in this unfolding controversy.

In order to understand how this approach differs from other document-based and thus often very text- or discourse-orientated methods, it seems beneficial to me to question the methodology with regard to both its epistemological and concrete practical characteristics. I hope that the considerations already discussed in the theory section will help me to explain how this focus on document practices comes about and what the intentions of this approach are.

6.1. Qualitative Document Analysis

For quite some time, documents have been somewhat neglected as an analytical phenomenon by the social sciences. Latour even cynically referred to them as "the most despised of ethnographic objects" (1990, p.54). Documents have traditionally been viewed as containers for various forms of text, information, illustrations, or instructions. In research, they are often primarily viewed as data to provide evidence that supports or refutes specific assumptions. Consequently, their content serves mainly as a resource for researchers (Prior, 2008).

More recently, document scholars, particularly in fields like anthropology and STS have developed alternative approaches to understanding documents as objects of research (c.f. Hull, 2012; Riles, 2006). These approaches emphasise that documents are more than mere instruments of representation. Instead of focusing solely on content analysis, the emphasis is placed on examining the functions that documents fulfill within their specific contexts. This perspective positions documents as active agents in the world, urging researchers to view documentation as an integral part of dynamic networks rather than a static collection of

immutable 'things' (Prior, 2008, p. 221). While this approach de-emphasises the representational aspect of documents, it does not render their content irrelevant. Instead, it highlights the importance of considering the various qualities of documents as essential elements of social interaction and organisation:

„Documents do more than represent the world; they often also refer to the practices, objects, rules, knowledge, and organisational forms that produced them. While documents may stand for something else, they are more than haulers, carrying preformed ideas or abstract semiotic constructions through space and time. Engaging with the constitutive dimensions of documents has already led STS scholars to the more selfconscious use of documents to address a number of major issues in the field.“ (Shankar et al., 2017, p. 62)

These considerations make sense if we consider them against the background of the principles of Actor Network Theory. As already discussed in Section 3.1., the representatives of actor-network theory (ANT) reject the assumption of the primacy of humans and also include 'things' as non-human actors in their analysis. The principle of generalised symmetry represents a rejection of the separation between material and human objects and between object and subject and instead places these traditional pairs of opposites on the same level. Together, these actors or actants form parts of an actor-network "that can be recruited into schemes of organised activity and regarded by others as allies, enemies, or perhaps simply instigators of further actions" (Prior, 2008, p. 828).

In science studies, for example, there has been an explicit interest in exploring the history or genealogy of scientific objects independently of their 'discoverer'. In that, particular attention has been paid to their materiality. Drawing on Latour's notion of delegation, Levy (2001) argues that documents are "bits of the material world - clay, stone, animal skin, plant fiber, sand - that we've imbued with the ability to speak" (p. 23). Referring to Latour and Woolgar's (1986) study of how laboratory practices can be explained by analysing the transformations of rats or individual chemicals in written records, Shankar et al. (2017) describe this process as follows:

“Instruments produce small documents containing various signs and inscriptions that can later be integrated into databases, combined or superimposed as figures and charts into conference presentations, patents, slides, and published articles. Documents' specific material instantiations make it possible for scientists and others to accumulate, compare, combine, contrast, manipulate, and evaluate work.” (p. 66)

Thus, when approaching documents as objects of research that means to acknowledge their status as material-semiotic objects. This means that their material properties are seen as

equally relevant for their function as is the meaning of the text or of the signs included in the document. The aim is to break down the distinction between what is *inside* and *outside* of texts.

Part of the anthropological tradition and also within STS therefore no longer treats documents as a mere purveyor of an external discourse, but as mediators that reorganise the meaning and events between the actants to which they relate:

“To restore analytically the visibility of documents, to look at rather than through them, is to treat them as mediators, things that “transform, translate, distort, and modify the meaning or the elements they are supposed to carry” (Latour, 2005, p. 39, in Hull, 2012, p. 253)

In relation to the world of documents, this means that we should examine how they, as living objects, shape political, economic or scientific activities in the same way that people do. One area in which this approach has been made productive is the study of documents as a constitutive element of bureaucratic processes. Hull (2012) and Prior (2008) discuss how documents are not just tools of bureaucracy, but actively shape and constitute it.

As in the production of knowledge, the material dimension of documents also plays a central role in the imagination and reproduction of other social structures, from individual bureaucratic organisations to the state. In this context, documents can perform both a controlling function - by providing stability through their orderliness and expressing norms that enable institutions to remain relatively unaffected by regime change, or more directly, by representing or guiding disciplinary measures; and a coordinating function - by guiding the coordination of certain practices across time and space. This duality is also referred to as double accountability:

“Documents are not solely accounts of work and documentations of past activities. They are also accounts for work. Documents often offer models for practice, as the things to which people should pay attention, when and as they shape ongoing practices.” (Shankar et al., 2017, p. 68)

Another point that effectively captures the double responsibility of documents is their interaction with their context. Documents often contain clues about the context in which they are used, indicating how they should be understood. As we will explore in the next section, documents can be categorised into different genres, offering structural hints about their interpretation and usage. These clues provide a framework and highlight specific aspects that must be considered.

Conversely, documents can also assume a certain level of background knowledge. Unlike well-organised documents, these types are often accessed based on the reader's priorities and interests. A reader unfamiliar with the genre or origin of such documents risks encountering incomplete, selective, or even contradictory background information. Some documents rely on

an understanding of a shared context, making it crucial for researchers to focus not only on content but also on the emergent social processes in which the document is embedded.

Thus, it is essential to examine documents for their reflexivity, i.e., their ability to explain their origin or context and the background knowledge they assume. For instance, certain documents may target entirely different audiences. Moments of reflexivity can illuminate how specific aspects are highlighted in research, bureaucracy, or policy-making, while others are omitted.

All of these analytical tools and perspectives are useful to transform seemingly neutral and sober documents into very active and lively agents. This praxeological approach is perhaps most succinctly formulated in ANT. However, numerous other authors have challenged or expanded the boundaries between the semiotic and the material in recent decades. Interestingly, Foucault himself, who is often regarded as a leading figure in discourse analysis and closely associated with a structuralist or linguistic tradition, is cited by Asdal and Reinertsen (2022) in their handbook on practice-oriented document analysis.

Thus, for Foucault, the starting point for his analysis – later known as his governmentality lectures – was not an examination of the structural functioning of social institutions but rather an exploration of specific practices as technologies of governance that affected the bodies of populations and individuals from afar. Also, his understanding of discourse reflects a praxeological perspective. He argued that discourses should not be seen merely as collections of signs that signify “elements referring to contents or representations but as practices that systematically form the objects of which they speak” (Foucault, 1989 [1972]: 49, in Asdal and Reinertsen, 2022, p. 212).

This convergence between Foucault and his French colleagues in ANT has significant implications for our understanding of agency. It introduces an agnostic approach to the types of entities capable of producing effects and acting, emphasising empirical analysis over preconceived definitions. Instead of attributing agency solely to specific actors or groups, the focus shifts to examining how agency is achieved in particular situations or networks and its resulting effects, rather than exclusively granting this ability to predefined entities.

In ANT terminology, the term *actor* is therefore replaced by *actant*, in order to emphasise the concept that agency is a relational property arising from the interactions of various elements within a network. As Asdal and Reinertsen explain through the semioticians Greimas and Courtés, “an actant can be thought of as that which accomplishes or undergoes an act, independently of all other determinations” (Greimas and Courtés, 1982, p.5, in Asdal and Reinertsen 2022, p. 219).

The question of how coordination and control are achieved in complex techno-scientific practices moves to the forefront of social construction analysis. Documents increasingly play

a central role in these efforts, necessitating a deeper understanding of these practices. This analysis often involves examining collections of documents rather than individual ones. Key questions include: Where were the documents found? What other documents are nearby, and how are they organised? What relationships exist between them?

This understanding of documents shifts the focus from simply describing their content to analysing the multiple appearances and assemblages of documents. It involves exploring how they manifest in certain contexts and transform while enacting or performing specific social realities. What practices and material properties enable certain documents to exert particular power as "immutable mobiles" (Latour, 1990)?

6.2. Practice-Oriented Document Analysis

To do justice to the double accountability of this master's thesis, the last section served to contextualise my specific approach to document analysis. Next, I am going to introduce six methodological moves, as outlined by Asdal & Reinertsen in their research handbook „Doing Document Analysis. A Practice-Oriented Method“ (2022). Thereby, I will demonstrate how a set of seemingly sober and neutral bureaucratic documents can be opened for quite interesting analytical reasons. What Asdal and Reinertsen propose is not a strict instruction, but an offer to the researcher to reveal how documents function not just as static texts, but as active participants in the practices they are part of. Let me thus explain which moves the practice-oriented document analysis entails.

The first step in their approach is to identify the specific locations or **sites** where documents are situated and used. By understanding these environments – whether whether they be offices, archives, or other institutional spaces – researchers can ask how these settings influence and are influenced by the presence and function of documents. Additionally, researchers can also approach documents themselves as specific sites, applying what they call a *document ethnography*. This move suggests that instead of merely viewing documents as sources of information about external practices, researchers should delve into the documents as complex sites where various activities, decisions, and interactions are inscribed and materialised.

Document ethnography entails closely examining the internal structure and content of documents to uncover the layers of work, negotiation, and meaning embedded within them. This involves analysing how documents are composed, organised, and presented, paying attention to the language, formats, and rhetorical strategies used.

Alongside this, it is essential to examine documents as **tools** that facilitate their creation, circulation, and use. This can, for example, relate to material and technical aspects, such as software, filing systems, and other instruments that play a significant role in determining how

documents operate within their respective practices. But this can also mean to look how documents accomplish different things and achieve certain goals within specific contexts. As tools, documents are employed to perform a range of actions in practice. For example, a policy document might be used to legitimise decisions, guide actions, or establish norms and standards within an organisation. A contract serves as a tool to formalise agreements, set obligations, and resolve disputes. In these cases, the document is an essential instrument that practitioners rely on to carry out their work. The "tool" aspect also refers to how documents help structure and organise activities. For instance, a report might be used to compile and present data in a way that influences decision-making, or a checklist might be used to ensure that all steps in a process are completed correctly. In these scenarios, the document functions as a practical tool that shapes and directs how tasks are performed. Moreover, documents as tools can mediate relationships between different actors. In these contexts, the document acts as a bridge that facilitates interaction and coordination among people.

Attention is also given to the activities and labor associated with documents, often referred to as document **work**. This includes the processes of writing, editing, copying, filing, and retrieving documents, all of which involve human effort and expertise. By exploring these processes, researchers can uncover the often-invisible work that ensures the life and functionality of documents within their practical contexts.

In bureaucratic settings, for example, decisions and policies are frequently documented, revised, and circulated before they are finalised. Documents are thus also used to ensure accountability and transparency, such as through reports, audits, and minutes of meetings. Document work highlights the processes involved in producing these records, which can reveal how decisions evolve over time through drafts, annotations, and approvals or how institutions manage their public image, comply with regulations, or address scrutiny. This analysis can uncover the iterative nature of decision-making in bureaucracies, where documents serve as sites of negotiation and contestation among different stakeholders.

Equally important is the analysis of the documents as **texts**. The language, rhetoric, and structure embedded within a document are critical in shaping its meaning and effectiveness. Understanding these textual dimensions allows researchers to see how documents communicate and exert influence within the practices they are part of. Documents often employ rhetorical strategies to persuade, inform, or instruct their audience. This move involves analysing how these strategies are used to achieve the document's objectives, such as how arguments are constructed, evidence is presented, or authority is established through the text. Additionally, the often reference other texts, whether explicitly through citations or implicitly through allusions or assumed knowledge. Analysing these intertextual connections helps

researchers understand how documents are situated within broader discourses and how they engage with, reinforce, or challenge existing knowledge or practices.

Not unimportantly, the genre of a document plays a significant role in shaping both its form and function. Be it a legal, a scientific, or a policy document – the genre of a text refers to a category of texts that share similar characteristics in terms of style, structure, purpose, and audience. It can also influence how the document is interpreted and what actions it prompts. A policy document, for example, might be designed to inform and guide future decisions, while a report might be aimed at providing a comprehensive account of past events or activities.

Furthermore, documents are not isolated from the **issues** they address. They are deeply intertwined with the problems, controversies, or debates that arise within their contexts. By engaging with these "document issues," researchers can explore how documents help define, manage, and sometimes resolve the concerns central to the practices they engage with. Asdal and Reinertsen's concept of "document as issue" thus aligns closely with the pragmatist understanding introduced in Section 3.2.1. They propose that documents are not merely passive records but are actively involved in the construction and negotiation of issues within specific practices. This mirrors Marres' (2007) idea that issues are constructed through engagement and that various elements – including human agents, technologies, and other material elements like documents – play a role in this process.

Finally, the approach involves tracing the **movement** and circulation of documents across different sites and practices. Documents are not static; they travel, change hands, and transform as they move through various contexts. Understanding these movements reveals the fluid and evolving nature of documents and their impact across different settings.

Document movement can also reveal broader networks and connections within and between organisations or institutions. By tracing how documents escape the laboratory or the office of another institution, researchers can map out relationships, hierarchies, and communication flows, showing how documents link different actors, sites, and practices together.

6.3. Thematic Analysis and Iterative Coding

Now that I have outlined the data sample and explained my methodological approach to the documents I am analysing, I owe a few words about the process of coding and theme building across the material.

The process of identifying themes is one which enables the recognition, analysis and reporting of patterns within data. A pivotal decision in thematic analysis is to define what constitutes a theme. As defined by Braun and Clarke (2006), a theme is a concept that encapsulates a significant aspect of the data in relation to the research question, and

represents a level of patterned response or meaning within the data set. The significance of a theme is not contingent upon its prevalence within the data set; rather, it is contingent upon its relevance to the research question. As Rivas (2018) aptly states, it "reduces the volume of the original data and turns it into something meaningful and easy to digest" (p. 430). Rather than a descriptive application to selected data extracts, it encourages researchers to examine data sets as a whole and to establish relations based on underlying concepts.

In line with my theoretical positioning, I use an abductive approach to identify patterns. Abductive reasoning allows for an iterative movement between data and theory, where initial observations guide the development of themes, which are then interpreted and reinterpreted in light of existing theoretical frameworks. As a tool of qualitative analysis, thematic analysis is considered flexible and applicable across different epistemological frameworks. It is therefore crucial to make explicit the theoretical positions and epistemological assumptions that underpin the analysis.

In this study, my approach is situated within a constructivist perspective. A constructivist perspective recognises that meaning and experience are not inherent in individuals but are socially produced and reproduced (Burr, 2015). This perspective influences how I interpret the data, focusing not only on the content of the EU documents or the NGO's responses but also on their position within a dynamic socio-material contexts. I thus try to observe "how reality is subject to multiple interests, perspectives and interpretations, mediated by interactions, language and cultural contexts" (Lahsen, 2023). From this perspective, we can examine the stability of knowledge claims made by differently situated actors in a symmetrical approach to each side of the controversy.

As stated, I mainly used thematic analysis (Braun and Clarke, 2006) to examine the various types of documents. However, I adapted my exact approach based on the type and context of the material.

For analysing the EU Policy Assemblage (Section 5.1.), which included extensive strategic and legal texts, I adopted a rather flexible and interpretive method. Instead of assigning a fixed set of codes to individual segments, I approached these documents with my sub-research questions in mind, focusing on identifying content that contributed to answering those questions. Two rounds of qualitative open coding were conducted using MAXQDA24. This entailed a systematic examination of the data, identifying and marking themes and patterns that were linked to the idea of integrating CDR into European climate policy and the introduction of the CRCF. In a second round of coding for the same file, the codes were refined with particular attention paid to how the coded passages relate to my sub-research questions. As I worked through these texts, I highlighted relevant sections and annotated their

significance, paying attention to how they informed my analysis rather than fitting them into predefined categories.

Although I was inspired by Asdal & Reinertsen's (2022) approach to document analysis (Section 6.2.), I did not systematically apply all of her moves to each document. Instead, I selectively incorporated her principles where they complemented my analysis, prioritising an understanding of what the documents "do" – their performative and strategic roles – over merely cataloging their explicit content. This combination of methods allowed me to address the diverse nature of the materials while maintaining analytical depth and coherence.

In contrast, for analysing the documents produced by NGOs, such as the comments and position papers (Section 5.2.), I followed a more structured approach. I read these documents closely, identifying recurring themes and coding relevant segments of text to categorise the material into broader topics, again using MAXQDA²⁴. I conducted two rounds of coding: in an initial round of coding, I focused on understanding the scope and framing of their comments. This involved examining the main topics and priorities addressed, the language and tone used (e.g., whether assertive, collaborative, or cautionary), and the issues at stake being referenced, either explicitly or implicitly. Additionally, I sought to identify both the explicit goals stated and any implicit strategies that could be inferred from the text. This exploratory phase provided a broad understanding of what the material contained, and providing a solid understanding of the range of concerns (a set of codes I generated during this first phase is included in Annex 11.1.).

As I was not aiming to record the individual positions in a 'realist' account, however, in the second round, I refined my analysis further by identifying recurring themes and categorising the material into mainly two broader topics, allowing for a more detailed and structured thematic analysis. These were derived in an iterative way between going through the data and relating it back to my theoretical discussion (Section 3.) and included incidents (Charmaz, 2014), in which NGO's were implicitly or explicitly confronting the European Commission's public consultation as a 'market device' (Callon & Muniesa, 2005) as well their referral to socio-material consequences of carbon markets on land-based removal practices, relating back to how this market-in-the-making implicates and threatens their lifeworlds (Marres, 2007).

As I analysed these incidents, I drafted memos to explore the connections between the themes and the insights they offered. Comparing these memos allowed me to identify patterns and relationships, helping ensure that the categories I used were both meaningful and well-suited to answering my research question.

6.4. Limitations

A research design is like a spectrum, enabling certain observations while potentially overlooking others. For example, a practice-oriented document analysis is well-suited for examining the transformation of a specific issue within an institution and the impact that these chains of documents can have on other actants. However, it might not fully capture the wider social or political processes that also play a crucial role in shaping and interpreting the issues and documents under study.

Other methodological approaches of studying regulatory or activist work *in situ* (Ehrenstein, 2022) could contrast or complement this, for example, by focusing in closer detail on meaning-making processes within individual organisations or coalitions. Qualitative interviews with representatives from NGO's might shed light on the emergence and transformation of potential coalitions during a consultation process, offering insights that might not be apparent through document analysis alone (cf. Asdal & Reinertsen, 2022; Ehrenstein, 2022). Such interviews could also dive deeper into their engagement with bureaucratic documents, focusing on which aspects they emphasise and how they rhetorically construct the underlying policy assemblage. Similarly, an approach similar to that of Braun (2009), in which he followed and interviewed bureaucrats from the European Commission as policy-entrepreneurs in the emergence of the EU ETS, could also be pursued in order to explore the role of relevant networks within and beyond the DG CLIMA.

However, in the case of this master thesis, question of access and scope have a decisive impact on the actual research I am capable of. It is only necessary to note that this research can only account for a small fragment of the ongoing regulatory project. Additionally, I decided to focus only on the traces of documents available on the website and not on other forms of documentation. Certainly, I found many other public statements from organisations that are included in my sample, and also other organisations, coalitions that are only emerging now (Carbon Market Watch, 2024). Throughout my research, I followed the traces of this controversy via newsletters, live streaming of political events or on social media platforms like LinkedIn or Twitter/X. The debate is indeed very engaged, and I would have liked to include at least some of it in my analysis. However, I think it is necessary to stick to a coherent approach. Not only because the scope of my master's thesis is limited, but also because I think it is valuable in itself to examine this controversy by looking at the political apparatus that has been created to reshape or transform the issue of CDR with this regulatory proposal, and to invite external stakeholders to have a say in these documents - to let the documents speak to each other.

In this sense, again, my aim is not to provide a complete actor or issue mapping of the debate; rather, my aim is to show, through the analysis of different document traces, the concerns that arise for different kinds of NGOs with the introduction of a market-based framework to the issue of CDR.

6.5. Interim Conclusion

As we've established in Section 6.1. and 6.2., documents play an important role in the transformation of intangible things into economic or market entities. This is also the case in my study. Documents are the central actants to which diverse groups and individuals keep referring throughout their public communications. They form nodes by establishing connections to various networks. As what will be shown, the proposal by the European Commission, for example, is subject to such multiple transformations: An initial piece of purposeful communication is followed by a Call for Evidence, which is followed by a first draft of a regulatory text. This draft is subject to many accompanying documents, comments from external parties as well as other bodies part of the legislative process, cycles of revisions, eventually leading to a "final" proposal. Notions of (im-)mutability serve as important indications on the status and function of the document in the policy cycle. Bureaucratic documents are often piled up like sediments and need to be analysed carefully to determine their composition. On closer inspection, they reveal things that may remain hidden when solely analysing the document for its content. They are the little tools of democracy (Asdal, 2008) that can be used to analyse the effort that goes into bringing certain realities into being.

I believe it is thus fruitful, if not necessary to examine the practices that actively shape and enact CDR as a market object – and, as it is the interest of my thesis, the ways and practices how different NGOs, consume, contribute or confront these efforts. Thus, I aim to writing in the spirit of a series of studies which follow documents as seemingly small and ordinary things, which however, are an indispensable part of every international institution, multilateral negotiation, or declaration on the issue of climate change.

Even more than a purely discursive analysis of the policy assemblage or the individual attached position papers of NGOs, I thus hope to draw some conclusions about the socio-material practices of engagement with bureaucracy in regulatory capitalism.

7. Empirical Findings

In the preceding chapters, I explored the interdisciplinary politics of carbon removal and carbon marketisation, emphasising how socio-material processes shape the transformation of controversial technologies into organisational actions. I approach markets as practical achievements of specific actor-networks that emerge through the arrangement of diverse socio-material elements. Metrics and indicators, regulatory reports, and even public consultations, can thus all be analysed as market devices that structure these processes. Crucially, such arrangements often generate overflows, creating points of contestation where market frameworks are challenged or resisted.

This led to the formulation of my guiding research question: *How does the European regulatory process of the CRCF transform carbon dioxide removal into a market object?*

The empirical analysis is divided into three subsections. Sections 7.1. and 7.2. explore the initial enactment of a carbon removal market. In section 7.1, I analyse how carbon removal is introduced and framed across key legislative documents, focusing on its construction as a market issue. This framing process, I argue, has broader implications that manifest in the subsequent development of the Carbon Removals and Carbon Farming Certification Framework (CRCF). Section 7.2 examines the Impact Assessment of the regulatory proposal, treating it as a site where various market devices are mobilised: First, the assessment reports that underpin the review of different carbon removal solutions and certification mechanisms; and second, the external public consultation, which also played a critical role in shaping the Impact Assessment.

In these subsections, I provide insights into what could be termed the sub-politics of markets, or, in Asdal's (2008) terms, the 'little tools of democracy'. Building on these findings, Section 7.3 links my analysis to the discussion on the role and politics of NGOs in carbon market processes. Here, I will examine how NGOs engage with the CRCF as a market-in-the-making, and how this process becomes a site of contestation – not just over the design of the market itself, but also over the market devices that shape its formation.

With this groundwork laid, I now turn to the case at hand.

7.1. Carving out a Domain for a Market

The creation of a market is never a given but rather a process of deliberate construction, involving the articulation of boundaries, the identification of participants, and the establishment of norms and devices to stabilise it. This section will explore how the European Commission's efforts to promote carbon removal certification can be seen as part of a broader strategy to carve out a new market domain. This involves framing carbon removal not only as a

technological solution but as an economic activity that fits into the broader objectives of the European Union. By tracing the development of key policy documents, I will show how the Commission gradually works to establish carbon removal as a market object, beginning with the Circular Economy Action Plan (CEAP).

7.1.1. The Circular Economy Action Plan

As noted in other studies (Brad & Schneider, 2023) the idea of “a regulatory framework for certification of carbon removals” first appeared in the CEAP in 2020 (European Commission, 2020a, p. 16). This policy document follows on from the EU Commission's first communication on the circular economy ‘Closing the loop - An EU action plan for the Circular Economy’, published in 2015 (European Commission, 2015). Since then, the circular economy has been discussed as a dominant imaginary restructuring EU industrial policy. As Völker et al. have stated elsewhere (2020) the concept of the circular economy is based “on imaginations of a perfect circle of slow material flows, a move from consumers to users together with ideas of de-coupling economic growth from environmental protection, but it still relies on current notions about competitiveness and security” (p. 105).

The 2020 strategy document essentially also builds on these imaginations, with the aim of setting out new design principles for production and supply chain processes that emphasise and transform the value of waste in a circular way to “[decouple] economic growth from resource use” (European Commission, 2020a, p. 2). From there it ought to inform a new European industrial strategy, which in turn would form the basis for emerging fields of business creation and entrepreneurship. With its focus on “[e]mpowering consumers and public buyers” (p. 5) the document suggests that the shift towards a circular economy involves not only changes in economic production but also in the behaviour and expectations of economic agents.

As the main content of the document focuses on circular strategies in so-called key product value chains, such as packaging, plastics or textiles, the European Commission's document presents in section 6 (p. 16) three ‘Crosscutting Actions’ in which circularity is discussed as a prerequisite for achieving climate neutrality. Notably, this is the first time that the idea of the CRCF is mentioned in an official EU document. This subsection mentions the importance of finding synergies between circular strategies and emission reduction efforts in the EU, to be pursued through systematic measurement and modelling tools as well as through the revision of the National Energy and Climate Plans. However,

“[n]ext to reducing greenhouse gas emissions, achieving climate neutrality will also require that carbon is removed from the atmosphere, used in our economy without being released, and stored for longer periods of time. Carbon removals can be nature

based, including through restoration of ecosystems, forest protection, afforestation, sustainable forest management and carbon farming sequestration, or based on increased circularity, for instance through long term storage in wood construction, re-use and storage of carbon in products such as mineralisation in building material.” (European Commission, 2020a, p. 16)

And it goes on:

“To **incentivise the uptake of carbon removal and increased circularity of carbon**, in full respect of the biodiversity objectives, the Commission will explore the development of a **regulatory framework for certification of carbon removals** based on robust and transparent carbon accounting to monitor and verify the authenticity of carbon removals.” (European Commission, 2020a, p. 16, emphasis in original)

Thus, this document defines the removal of carbon from the atmosphere and its storage, without releasing it back into the atmosphere for *longer periods of time*, as a necessary strategy for achieving climate neutrality alongside efforts to reduce emissions. It is interesting to note the distinction between *nature based* carbon removals and those based on practices that apply principles of *increased circularity*, which both function as umbrella terms to subsume a range of different practices. What we see in this admittedly very short mentioning of the concept of carbon removal in this paragraph is a merging of the idea of carbon removal with the notion of circularity. Two types of carbon removal activities are outlined that could complement efforts to reduce emissions but, as the second excerpt explains, would fundamentally require a regulatory framework to verify, monitor and certify carbon removal activities. However, the CEAP itself does not elaborate on the operational details of this framework in these two short paragraphs.

7.1.2. The Farm To Fork Strategy

To anticipate, these details are neither explained in the Farm to Fork Strategy, which was released by the Commission shortly after the CEAP in May 2020. Still, it is a crucial document for understanding the further uptake of the concept of carbon removal as a market issue. As such, it imports the proclaimed idea of circularity – decoupling economic growth from resource use – into the area of agricultural production. By arguing that

“a shift to a sustainable food system can bring environmental, health and social benefits, offer economic gains and ensure that the recovery from the crisis puts us onto a sustainable path” (European Commission, 2020b, p. 2),

the document echoes the Covid-19 pandemic and the economic downturn that was spreading across the globe as this communication was being drafted and published. But what is its overall focus?

The title of the strategy sets the scene, as the document aims to develop a “new comprehensive approach to how Europeans value food sustainability.” (European Commission, 2020b, p. 2) In a similar vein to the CEAP, it centers both production and consumption patterns. Above that, it emphasises research, innovation and technology as a means of unlocking new market opportunities (p. 15) and places agricultural standards as a way to increase revenues, and to set global standards, by incentivising foreign countries with trade relations to change their production accordingly (p. 17, f.). This overall strategy is captured in the following quote:

“The transition to sustainable food systems is also a **huge economic opportunity**. Citizens’ expectations are evolving and driving significant change in the food market. This is an opportunity for farmers, fishers and aquaculture producers, as well as food processors and food services. This transition will allow them to make sustainability their trademark and to guarantee the future of the EU food chain before their competitors outside the EU do so. The transition to sustainability presents a ‘first mover’ opportunity for all actors in the EU food chain.” (European Commission, 2020b, p. 3, emphasis in original)

Similar to what we have analysed for the idea of circularity, this quote on the transition to sustainable food systems stresses notions of international competitiveness and security, by positioning Europe as a frontrunner in a global market by aligning economic growth with environmental stewardship. As coherent as this overarching narrative might be, one might still wonder, why a strategy on the transition of the food system is of interest for studying carbon removals.

This is because, in section “2.1 Ensuring sustainable food production” (European Commission, 2020b, p. 5) carbon sequestration is mentioned as one such solution that could be deployed by farmers and foresters to

“make the best use of nature-based, technological, digital, and space-based solutions to deliver better climate and environmental results, increase climate resilience and reduce and optimise the use of inputs (e.g. pesticides, fertilisers). These solutions require **human and financial investment**, but also promise higher returns by creating added value and by reducing costs” (European Commission, 2020b, p. 5, emphasis in original).

That is, beyond food production and consumption patterns, this document develops a vision of a wider range of *food value chain practices* that could be turned into future business models, if only the right incentives were in place. We encountered the idea of carbon farming or carbon sequestration already in the CEAP, where it was mentioned as one example for a nature based carbon removal activity. In the Farm to Fork strategy, it is described as

“[f]arming practices that remove CO₂ from the atmosphere[, which] contribute to the climate neutrality objective (...)”,

and what is a notable addendum,

“should be rewarded, either via the common agricultural policy (CAP) or other public or private initiatives (carbon market).” (European Commission, 2020b, p. 5)

Thus, the strategy document sees a potential for further upscaling of carbon sequestration practices and stresses the need to better harness and incentivise these practices. With the CAP as an example for a *public initiative* and the mentioned but not specified carbon markets as a *private initiative*, the Farm to Fork Strategy introduces different options of reward mechanisms.

What's important to note is that the bracketed mentioning of carbon markets is linked to a footnote, in which it is specified that “[r]obust certification rules for carbon removals in agriculture and forestry are the first step to enable payments to farmers and foresters for the carbon sequestration they provide.” (European Commission, 2020b, p. 5)

This brief passage – in fact only 2 paragraphs and a footnote – marks a substantial shift in our understanding of the EUCOM's uptake of carbon removals. Specifically, of the range of options listed by the CEAP as viable carbon removal solutions, carbon sequestration is the solution of interest here. In particular, it aligns the concept of carbon removal, which is deemed necessary for reaching climate neutrality, with the stated goal of transforming European food systems by promoting certain practices as new business models that lie at the intersection of both projects.

In analysing how these documents carve out a domain for a market for carbon removals, I believe this is significant. While the CEAP set out a range of options to consider under the concept of carbon removal, as well as the idea of a certification framework for these activities to be verified and credited, the Farm to Fork Strategy now links this policy project not only to the agricultural sector but also to potential reward mechanisms that would help finance practices such as carbon sequestration.

In doing so it differentiates between public and private initiatives. If we are thinking about markets from a social science perspective here, this distinction matters. Because as the report

states, these different schemes, for example, would involve a different set of actors to be involved:

“Robust certification rules for carbon removals in agriculture and forestry are the first step to enable payments to farmers and foresters for the carbon sequestration they provide. Member States could use these rules to design CAP payments based on the carbon sequestered; moreover, private companies could also be interested in purchasing such certificates to support climate action, thus providing an additional incentive (on top of CAP payments) to farmers and foresters for carbon sequestration.” (European Commission, 2020b, p. 5, footnote 10)

In this quote, we can see that different actors are thought of to be part of different reward mechanisms. They involve *farmers* and *foresters* as the practitioners to invest their workforce into those envisioned business models, European *member states*, who in the case of a public initiative such as the CAP could distribute finances in the form of payments to those practitioners, and we have *private companies*, which in the case of private initiatives are thought of to contribute to those financial incentives by purchasing certificates. What seems to bind all of these actors together, are the mentioned robust certification rules. After they were first introduced in the CEAP, it seems as if we can observe an emergent actor attaining quite some power over connecting various narratives or imaginaries (circularity) with existing legislations (such as the mentioned Climate Pact) or policy infrastructures (e.g. the CAP or ‘carbon markets’) on a European level.

7.1.3. The Sustainable Carbon Cycles Communication

By now, we have touched upon two key documents that brought up the concept of carbon removal in very distinct forms and in reasonable limited space. However, at this point there is no binding proposal in sight. The Sustainable Carbon Cycles communication (European Commission, 2021a), published in December 2021 is then the first strategy document to devote a full report on carbon management³ in the European Union. It's clear from the language of the document that the idea of circularity is again key to the communication's imaginary. It starts off quite essential:

“Carbon is the atom of life, of our societies and economies. Carbon is in human DNA. Half the weight of the food we eat is carbon. Transforming limestone and iron ore into the cement and steel of our cities involves processing carbon. Organic chemistry exploits the uniqueness of carbon to produce highly complex molecules for the

³ The Sustainable Carbon Cycles Communication is not only a key document in the policy cycle of the CRCF, but also for the adoption of the Industrial Carbon Management Strategy (European Commission, 2024b), which was adopted in February 2024.

pharmaceuticals, chemicals, plastics and advanced materials of our daily life. Carbon-based fossil fuels have powered our homes, factories and vehicles for more than a century.” (European Commission, 2021a, p. 1)

Thereby, it sets the stage for a description of carbon as a vital and foundational resource of society, which dramatic cumulation, however, has spurred a number of dramatic effects:

“As result, the global climate is warming, biodiversity is disappearing, oceans are getting more acid and extreme weather events are becoming more frequent. In turn, short-term carbon cycles between vegetation and atmosphere are disturbed and sea levels are rising due to the impact of climate change on lands, forests, seas and the cryosphere. In some regions, this is amplified by the unsustainable exploitation of natural resources. All these feedback loops accelerate the climate and biodiversity crises and present direct threat to ecosystems functioning and human societies.” (European Commission, 2021a, p. 1)

As unsurprising as it may be to start a political communication in this way by considering the issue at stake, the specific circular rhetoric of the problem framing is nevertheless important to note. To counter these ‘externalities’, it would therefore be necessary to create “sustainable and climate-resilient carbon cycles” (European Commission, 2021a, p. 1). Not only would those cycles be required to balance emissions for reaching climate-neutrality, but also for replacing carbon as a resource that would no longer come from fossil fuel extraction in the future. More specifically, carbon removal, as a key pillar of this strategy, is presented alongside recycled carbon from waste and sustainable biomass as an activity of a European circular economy to provide feedstock for industrial production.

In addition to emission reduction, as well as the recycling of carbon waste streams through circular strategies and the bioeconomy, carbon removal is envisioned as those activities

“that capture CO₂ from the atmosphere and store it for the long term, either in ecosystems through nature protection and carbon farming solutions or in other storage forms through industrial solutions” (European Commission, 2021a, p. 2)

By that we have a third definition of removals, in which the principle that those activities *capture CO₂ from the atmosphere and store it for the long term*, is quite similar to the aforementioned versions, yet the distinction of removals according to its storage type (nature protection and carbon farming vs industrial solutions) is new.

The documents acknowledges that promoting such sustainable carbon cycles are a complex and long-term project. The objective for this first Communication is thus explained, as follows:

“This Communication focuses on the short-term actions to upscale carbon farming as a business model incentivising practices on natural ecosystems that increase carbon sequestration (section 2) and to foster a new industrial value chain for the sustainable capture, recycling, transport, and storage of carbon (section 3).” (European Commission, 2021a, p. 2)

As with the first two documents, I will try to analyse this Communication in terms of how a domain for a market for carbon removals is carved out and what specific role the idea of a certification framework plays. To do this, I propose to follow the structure of the document – that is, to begin with its uptake of carbon farming as one carbon removal solution, before we look at how the document introduces industrial removal solutions and finally the substantiation of the idea of a regulatory framework for the certification of carbon removals.

Building on the framework of the Farm to Fork Strategy, the SCC states that the goal is to make carbon farming a viable business model. This would require “direct incentives at the level of land managers to increase carbon removals and protect carbon stocks” (European Commission, 2021a, p. 3). It is noteworthy that the SCC also refers to the amendment to the *Regulation on the Land Use, Land Use Change, and Forestry (LULUCF)* adopted in the same year. This regulation, which focuses on managing carbon emissions and removals from land and forestry, sets – for the first time – a net removal target for the land sector at the European level. The target is to achieve an annual removal capacity of 310 MtCO₂e (million tonnes of carbon dioxide equivalent) by 2030, reversing the trend of decreasing removal capacity of natural sinks. However, with this target, the proposal would not provide incentives to increase the potential, which is why the SCC strives to develop strategies, “to enable key stakeholders in the land sector to play their crucial role in sustainable carbon management on the way to climate neutrality” (European Commission, 2021a, p. 4).

For the practice of carbon farming, the communication notes that

“recently, an increasing number of private carbon farming initiatives have emerged where the land managers sell carbon credits on voluntary carbon markets.” (European Commission, 2021a, p. 4)

Those *credits* could be used as an “additional ‘product’ that land managers can sell together with their traditional products such as food and biomass” (European Commission, 2021a, p. 4). As such, the document not only identifies the supply side, but also a demand side, in which buyers are envisioned as “economic operators within the bioeconomy such as food processing companies that want to reduce the carbon footprint in their own value chains” (European Commission, 2021a, p. 5), but also more broadly, “companies and individuals who want to

financially contribute to more climate action on the land and to neutralise their own unavoidable emissions” (European Commission, 2021a, p. 4).

I point to this passage because it is the first time that commodity of any type appears in the EUCOM documents on carbon farming as a practice, or carbon removal in general. In its speculative description of potential actors as sellers and buyers, it develops a imaginative supply and demand side of a market, between which carbon credits could be freely exchanged. More than that, in suggesting food processing companies as an example of a buyer, it connects with the Farm to Form Strategy and the overarching aim of promoting a sustainable food system, embracing the circular imaginary and again evoking the fusion of economic growth and environmental protection.

However, this seemingly ideal mode of transaction would face several barriers that prevent a larger upscaling of carbon farming activities as a business model. According to the document, these include:

- “financial burden resulting from the costs of carbon farming management practices and uncertainty about revenue possibilities;
- uncertainty or lack of public trust in the reliability of standards in voluntary carbon markets, in conjunction with concerns around environmental integrity, additionality or permanence;
- unavailability, complexity or high costs of robust monitoring, reporting and verification systems;
- insufficiently tailored training and advisory services.” (European Commission, 2021a, p. 6)

In response to these barriers, the EUCOM identifies three mechanisms that can be provided directly: *public funding to 'kick-start' carbon farming (p. 7-8); standardisation of monitoring, reporting, and verification (MRV) methodologies (8-9); and improving knowledge, data management and tailored advisory services for land managers (p. 9-11)*. Public funding is therefore seen primarily as an initial stimulus to help land managers roll out the practices and assist with additional costs for MRV or to develop advisory services that can help fill knowledge gaps:

“Public funding is therefore key to complementing revenue possibilities from private markets, which will secure land managers’ interest in this business model and build confidence in carbon farming schemes.” (European Commission, 2021a, p. 7)

In addition to the aforementioned CAP, the SCC also mentions Horizon Europe, in particular the mission to promote soil health: ‘A Soil Deal for Europe’, the LIFE programme, cohesion

policy measures such as the Just Transition Fund and, in general, state aid from the member states as potential sources of public funding.

For my analysis, it is important to note that public funding is framed as a "kickstart," while the sought-after mechanism is a market-based structure. By positioning public funding as a temporary measure, the document signals a transition from state intervention to private market responsibility. This distinction between public funding as a short-term stimulus and the long-term reliance on private markets is critical to understanding how carbon removals are being constructed as market objects. The state's role is not to maintain carbon farming through continued funding, but to create the initial conditions – such as developing MRV systems and advisory services – that enable private actors to participate in carbon farming as a business model. In addition, it is assumed that a voluntary carbon market already exists which, once the initial barriers are removed, could also provide a framework for credits from carbon farming practices. The fact that this assumption is perhaps not as straightforward as it first appears in the document becomes clear when we look at the role of the MRV frameworks, as presented in the SCC.

Thus, the rationale for creating a *transparent MRV framework* for carbon farming practices is that existing private schemes would use different methodologies in the voluntary carbon markets. This would give rise to the following issues:

„Without a high degree of transparency, environmental integrity, and methodology standardisation, buyers will be hesitant about the quality of the offered carbon farming credits, land managers will find it difficult to estimate their potential revenues, policy makers will be reluctant to allow the use of such credits for compliance into the regulatory framework and it will be challenging to develop a successful market.”
(European Commission, 2021a, p. 8)

This statement underscores that the pursued market viability depends not only on the supply of carbon credits but also on ensuring their *credibility*. The introduction of standardised MRV protocols addresses concerns about trust and reliability, which are essential for establishing confidence among land managers, buyers, and policymakers alike. For land managers, such protocols would provide a clearer estimate of the economic benefits associated with carbon farming practices, while for buyers and regulators, they ensure the environmental integrity of the carbon credits, making them a necessary instrument for compliance and market participation.

In this context, the practical application of standardised MRV protocols is positioned as a crucial step toward the creation of an “EU regulated market for climate action in the land sector after 2030” (European Commission, 2021a, p. 9). This reference directly ties the MRV

framework to the broader legal objective outlined in the LULUCF proposal, which sets a net removal target for 2030.

As a third mechanism to promote carbon farming as a business model, the SCC stresses the importance of improving knowledge, data management, and tailored advisory services to land managers. This section contains a compilation of different datasets and tools that exist in existing systems and legal frameworks in Europe and could be used to scale up carbon farming. These include remote sensing and satellite services (e.g., Copernicus) for monitoring land use, the Farm Sustainability Tool for Nutrients (FaST), a digital application that will in the future be able to calculate greenhouse gas balances in addition to nutrient balances, as well as knowledge exchange formats and advisory services, such as those provided within the Agricultural Knowledge and Innovation System (AKIS) or the European Climate Pact, to share awareness and experience among farmers and forest owners.

The Horizon Europe mission “A Soil Deal for Europe” will also play a crucial role in this regard. By fostering the transition to healthy soils by 2030, the Soil Deal aligns with Green Deal commitments for climate, biodiversity, and sustainable food systems. Through its planned network of 100 living laboratories and lighthouses, it will test, demonstrate, and upscale solutions for carbon farming, providing much-needed innovation and practical implementation pathways. The soil monitoring component of the mission will further support harmonised soil monitoring efforts across Europe, enhancing the availability of data for carbon farming. Together, these initiatives position Horizon Europe as a cornerstone in the research and innovation ecosystem necessary to advance carbon farming practices at scale.

Each of these individual measures could warrant its own empirical analysis to explore how they contribute to the broader project of making carbon farming a business model and the socio-technical relationships that emerge from this process. At this point, however, it is rather my idea, to highlight another level of this market creation, which focuses on how these knowledge systems and advisory tools contribute to the stabilisation of carbon farming as a viable business model. By linking existing infrastructures such as remote sensing tools, nutrient balance applications, and knowledge exchange platforms, the SCC not only promotes the technological and scientific underpinnings of carbon farming but also integrates these into a broader socio-technical network.

These efforts highlight the role of expertise, data, and technical infrastructure as essential components in the process of marketisation. The integration of knowledge platforms like AKIS and digital tools like FaST illustrates how carbon farming is increasingly framed not only as an environmental solution but as a data-driven, innovation-centred practice. This, in turn, shapes the way carbon farming is perceived by stakeholders, encouraging land managers to adopt

these practices by offering them the tools, data, and advice needed to succeed within this emerging market.

Moreover, it shows how the market is being actively constructed by connecting financial incentives with technological solutions and advisory services. This orchestrated alignment of different human and non-human actors – from satellite monitoring to farmer knowledge-sharing systems – creates the scaffolding envisioned to transform carbon farming into a standardised, measurable and ultimately tradable market commodity. Creating a market for carbon removal is therefore not just a matter of establishing rules and regulations, but of embedding these activities within a socio-technical system that includes knowledge production and dissemination, monitoring and data sharing mechanisms.

Up to this point, I have outlined how the SCC seeks to transform carbon farming into a viable business model. In the following lines, we are still following the SCC, but now focusing on how it carves out a market for industrial removals – another set of solutions, which are presented alongside the practices of carbon farming. As we follow this progression, I shall again analyse how exactly this market for industrial removals is thought of in differentiation to this for carbon farming. How is it enacted? Which connections does it forge? Does it form part of a similar network, or is it differentiated?

Following the section on carbon farming, the document dedicates a chapter to the industrial capture, use, and storage of carbon. In line with the document's broader objective to promote sustainable carbon cycles, this section includes sub-sections on “A sustainable bio-economy” (p. 14) and “Creating an internal market for CO₂ capture, use and storage” (p. 15), both of which propose different solutions that store carbon “either permanently in geological sites or in new long-lasting products” (European Commission, 2021a, p. 14). These proposed solutions form the basis of new market formations that must be stabilised through the translation of various actors and interests.

It is crucial to note that storing carbon in products entails the temporary reuse of captured CO₂, rather than permanent storage, raising questions about the legitimacy of such practices as long-term removal solutions. Furthermore, capturing CO₂ at industrial sites is generally considered a form of emission reduction, not carbon removal. Yet, in the SCC, these solutions are bundled with carbon removal strategies in this chapter on industrial carbon. These ambiguities are not isolated but recur throughout the document, pointing to the dynamic and sometimes unstable process through which these markets are co-constructed. By tracing where and how these ambiguities emerge, we can better understand the co-development of these solutions and their influence on policy formation in this evolving market.

In the rationale for these solutions, the following quotes stand out:

“The EU consumed approximately one billion tonne of biogenic (45%) and fossil (54%) carbon for the functioning of its economy in 2018. The carbon is used to provide food (25%), energy (56%) and materials (19%) and only a very small fraction of the carbon used today is from recycled origin (1%). Beyond decarbonising its energy system to be climate neutral by 2050, the EU will also need to rethink its sourcing of carbon as feedstock for industrial production. Fossil carbon should be replaced by more sustainable streams of recycled carbon from waste, sustainable biomass and directly from the atmosphere.” (European Commission, 2021a, p. 13)

(...)

“Since natural resources are limited and the bioeconomy cannot provide all the carbon to fulfil the energy and material needs of a climate-neutral EU economy in 2050, other streams of carbon should be developed to replace fossil carbon, including capturing CO₂ directly from the atmosphere, also called Direct Air Capture (DAC). (European Commission, 2021a, p. 15)

These excerpts underscore carbon's persistent role as a feedstock throughout the SCC and emphasise the need for a rethinking of carbon sourcing. This reconfiguration of carbon as a resource – whether from recycled materials, sustainable biomass, or atmospheric capture – illustrates the transformation of carbon into various commodities, each with its own network of associated technologies, policies, and actors. Emerging technologies like Direct Air Capture and Storage (DACCS), Bio-Energy Capture and Storage (BECCS), and biochar are framed as key solutions to “fulfil the energy and material needs of a climate-neutral EU economy in 2050” (European Commission, 2021a, p. 15).

By promoting the industrial capture and storage of carbon, the SCC not only positions these technologies as essential for mitigating emissions but also frames them as necessary for achieving or maintaining a well-functioning circular economy. This narrative interlinks carbon removal with the broader bioeconomy and circular economy strategies, thereby expanding the domain of carbon removal beyond natural systems, like agriculture and forestry, into industrial processes.

However, the scaling of these solutions would need to be actively supported:

“[I]t is pivotal that the EU supports today the development of emerging technologies that are needed to achieve climate neutrality in 2050. Industrial projects have long lead times and project developers are often faced with scale-up challenges and fierce global competition, in particular in the energy-intensive industries, where large amounts of products will have to be produced through new processes.” (European Commission, 2021a, p. 15)

This brings into focus two critical challenges: “the lack of sufficient capacity for transport and storage of CO₂” and the missing of an “efficient systems for the traceability of captured CO₂” (p.19). With regard to storage and transport capacity, which EUCOM identifies as one of the main bottlenecks, the document cites the 'Directive on the geological storage of CO₂', also known as the CCS Directive, as an existing legal framework that would already provide a legal framework for “environmentally safe geological storage of CO₂ by covering all CO₂ storage in geological formations in the European Economic Area” (European Commission, 2021a, p. 16).

The development of infrastructure is now a really interesting point. This is where the connection between the capture technologies mentioned in the document, such as DACCS or BECCS, and their technologically related but different comrades, Carbon Capture and Storage (CCS) and Carbon Capture and Utilisation (CCU), becomes apparent. The EUCOM communication shows that the technologies would be part of the same production and value chain.

In addition to pipelines, trucks and platforms, the role of funding for research and development emerges as another critical practice in this network. Similar to carbon farming, European research and innovation programmes play a crucial role here, e.g. the Horizon Europe programme, which has been promoting CCS/CCU and removal activities in a joint research area for years, or the European Innovation Council Pathfinder Challenge "Carbon and Nitrogen Management and Valorisation" (European Commission, 2021a, p. 16).

It is interesting to note that the Innovation Fund, which is the key source to financial support for 'low carbon technologies' in the EU, is funded from the revenues of the EU ETS. By using actual revenues from the EU ETS to subsidise these technologies, the fund acts as a stabilising force in this evolving market, also creating a direct economic feedback loop that potentially supports the expansion of new carbon removal infrastructures. However, the Communication mentions the Innovation Fund not only in the sense that it can be used for investments in CCS, CCU and carbon removal technologies, but also that it indirectly sets a price signal for the desired internal market. It is estimated that EUR 25 billion will be invested through this instrument over the period 2021-2030, based on a predicted carbon price of EUR 50/tCO₂ (European Commission, 2022h).

In this complex system of different financial infrastructures and research and development programmes, this link stands out to me because it links the existing compliance market for CO₂ allowances with incentives for developing novel low-carbon technologies, contributing to creating the envisioned internal market for capture, use, and storage of CO₂ whose domain has yet to be worked out.

It does so in two ways. First, by promoting specific technologies deemed eligible for support under the Innovation Fund, the system creates pathways for certain low-carbon technologies to receive financial backing. However, as we shall see in the further analysis, the process of determining which technologies qualify is far from straightforward – it is the outcome of complex institutional assessments and negotiations.

This reflects how decisions on eligibility are not merely technical but also shaped by broader political, economic, and regulatory considerations, which in turn influence the future trajectory of the market. Additionally, this process hints at the presence of a “technological fix”, in which complex challenges like climate change are approached primarily through the lens of technological innovation. The emphasis on scaling up technologies included in this industrial cluster highlights a reliance on engineered solutions to address climate goals, further embedding these innovations within the evolving market framework.

Second, the Innovation Fund not only promotes specific technologies but also conditions the development of the carbon market through the price signal generated by the EU ETS. This price signal, crucial for incentivising investments in low-carbon technologies, is not stable or given; it is produced conditionally, shaped by the dynamics of the compliance market. Fluctuations in the carbon price directly impact the economic feasibility of scaling up technologies like CCS, CCU, and carbon removal. The anticipated EUR 25 billion in investments over 2021-2030 is based on a projected carbon price of EUR 50/tCO₂, but this figure is far from guaranteed, as past volatility in the EU ETS demonstrates.

Thus, the price signal becomes a key actor in the network, dynamically influencing the market’s evolution. Rather than merely reflecting detached market dynamics, it co-produces market conditions, determining the extent to which certain technologies can be scaled up. The conditional nature of this signal reveals that the development of carbon removal infrastructures depends not only on technological readiness or regulatory support but also on the financial and market mechanisms that can stabilise or destabilise the entire system. This illustrates how economic instruments, like the EU ETS, are intertwined with technological fixes, but their efficacy is always contingent on broader market forces and regulatory frameworks.

Consequently, the effectiveness of the Innovation Fund as a mechanism for driving investment in carbon removal technologies hinges on these broader conditions. The fund’s potential to stabilise and incentivise the market for industrial removal is thus contingent on the continuous production and maintenance of this price signal (Perino, 2024), revealing the intricate relationship between regulatory frameworks and market development.

The financial incentives created through the Innovation Fund and the associated price signal illustrate the ambition to promote technological solutions for carbon removals. At the same

time, this highlights the necessity of embedding these technologies within a regulatory framework to assess their effectiveness and long-term impacts. According to the SCC, it will therefore be necessary to develop a monitoring, reporting, and accounting system designed to differentiate between technologies that permanently remove carbon and those that only store it temporarily:

„This will allow a differentiation between industrial solutions that permanently remove carbon dioxide and those that store the carbon for shorter periods or without a net decrease of the CO₂ concentration in the atmosphere. Such system, duly considering the existing legal framework of the EU ETS and its rules for the monitoring and reporting of emission, would provide the foundation for the certification of industrial carbon removals in the upcoming EU regulatory framework presented in the section 4. The certification framework will facilitate the purchase of carbon removal credits by private or public buyers. Carbon removal projects can increase their viability by combining the grants from the Innovation Fund with the revenues from the sale of carbon removal credits, whereby any double funding has to be duly avoided.” (European Commission 2021a, p. 18)

It is interesting to note that the SCC considers a regulatory framework for the identification of CO₂-absorbing activities, both at the level of "individual land holdings" in carbon farming and in industrial solutions - despite their different practical and regulatory embedding - to be "a pre-condition for any sound regulation of, and enhanced uptake of, market-based carbon removal solutions" (European Commission 2021a, p. 20).

So what are the characteristics and benefits of such a project? This is also the first time that the design of such a certification framework is discussed more closely. On the one hand, the EUCOM sets out some options for the design of such a framework, which should determine the quality criteria for assessing carbon removals. These include the risk of uncontrolled re-emissions, also discussed under the notion of permanence; different approaches to determining the additionality of removal activities, i.e. whether the amount of removals generated is greater than that of standard land management - issues that have already been discussed in the context of creating counterfactuals for carbon offsetting (Ehrenstein & Muniesa, 2013); and the determination of so-called biodiversity co-benefits. The lack of standardisation in these areas is seen as a "major barrier to the expansion of the voluntary carbon market" (European Commission 2021a, p. 20).

Alongside these 'technical challenges' listed in the document are a number of options presented by the EUCOM for the 'effective implementation' of the framework, i.e. the governance options. In presenting the various options considered, EUCOM presents its

priorities for efficiency as "cost-effective and market-friendly" (European Commission 2021a, p. 20). It therefore considers administrative costs, including those for setting up and maintaining MRV measures, to be one of the key constraints.

Aiming to meeting those priorities, the EUCOM declared to set up a "transparent process for the definition and updating of the certification rules" (European Commission 2021a, p. 20), including the involvement of stakeholders in the preparation of the legislative proposal and the accompanying impact assessment. The options considered would thereby range "from a single, centralised EU system through to a more decentralised structure" (European Commission 2021a, p. 20). It is at this stage, that the EUCOM for the first time announces a call for evidence as well as a public conference on the matter to be pursued in order to "strengthen the Commission's understanding of carbon removals and key issues for their accounting and certification, and [...] to bring together representatives from academia, business sectors, public organisations, NGOs and civil society to exchange views on the EU-wide certification concept." (European Commission 2021a, p. 20)

Having outlined these challenges and approaches, the EUCOM develops an optimistic outlook of the future of carbon removals in the EU that can best be described in an experimental fashion. The following quote from the communication shows how the development of the certification framework is considered as a tool for the EUCOM to acquire crucial knowledge about the issue of removals and its governance:

„The next few years should see the scaling up of carbon removals – be it in the land sector or in industry – as well as gaining market and regulatory experience, in particular with regard to improvements to monitoring, reporting and verification. Carbon farming and industrial projects that invest in carbon removals today should have a prospect of a future robust accounting and certification framework that ensures comparability and environmental integrity, and recognition of the action started already on the ground.“ (European Commission 2021a, p. 20)

Beyond that, the successful establishment of such a regulatory framework is depicted as a competitive advantage in a "fierce global competition" (European Commission 2021a, p. 15) to scale up related technologies:

“Being a pioneer in the regulatory certification of carbon removals will make the EU the trailblaser. This will provide a global inspiration for designing, under Article 6, robust and ambitious methodologies aligned with the objective of the Paris Agreement.” (European Commission 2021a, p. 21)

As the EUCOM stated in the beginning outlining its strategy, that it would focus on the short-term actions in carbon farming and industrial removals, it however also denotes that a reflection

on the long-term implications warrant a reflection. Notably, it comes to acknowledge that given the long-term endeavor and the importance that removals ought to play after 2050, the document stresses “the further integration of carbon removals into the EU regulatory and compliance frameworks, post-2030, taking into account the scientifically validated methodologies.” (European Commission 2021a, p. 3)

This is the first time that the EUCOM brings up the idea of an integration of removals into the EU ETS, the existing compliance markets for emission certificates, which currently covers the energy sector and energy-intensive industry, intra-European aviation and maritime transport and, from 2027, European emissions trading for fuels, particularly in the transport and building sectors.

With that the Sustainable Carbon Cycles Communication not only defines the first step, which is the establishment of a transparent regulatory framework for certifying removals, but also gives a hint at where this project might lead up to, the integration into the EU ETS. In section 3 of the communication, the EUCOM further substantialises this idea, after which industrial carbon removals that *permanently* remove carbon dioxide from the atmosphere (as opposed to solutions that store carbon dioxide in products (CCU) could be integrated into the EU ETS, allowing carbon removal project developers to access both financing from the Innovation Fund as well as through selling credits through this compliance market. (European Commission 2021a, p. 17)

7.1.4. Interim Conclusion

When thinking about how these documents help to carve out a domain for a carbon removal market, what becomes immediately clear is the multitude of overlapping and intersecting notions of markets that emerge. In conceptualising the role of carbon removals in the European Union, these documents point to several versions of markets, each with different purposes and objectives. In fact, the domain for a carbon removal market in these documents is at the same time embedded in and raised by the help of other existing market infrastructures.

From the European single market, framed in terms of security and competitiveness, which ought to compete on a global market, predominantly by the idea of extending EU standards of various goods and products beyond its borders. In this context, carbon farming is framed as an issue of enhancing the quality of European agricultural production, which already is subject to several public and private reward mechanisms such as the eco-schemes under the Common Agricultural Policy (CAP) or the trading of carbon credits in voluntary carbon markets.

In addition to these notions of existing market frames, the documents also project future markets for carbon removals, especially those related to carbon farming and for industrial removals based on novel “low-carbon technologies”.

Creating a domain for carbon removal markets involves both the forging of entirely new markets and the calibration of existing ones to function as market devices. The policy work observed in these documents is deeply engaged in establishing links between different legal, economic, and social infrastructures. The EU ETS, for example, is not only a tool for regulating emissions but is also positioned as a mechanism for promoting innovative technologies.

This dual process of creating and calibrating markets also highlights the complex interplay between public and private reward mechanisms. Public initiatives, such as government funding and incentives, are primarily seen as a way to kick-start the market, while private, market-based mechanisms are envisioned as the ultimate goal for sustaining carbon removal efforts over the long term. A critical component of these private, market-based mechanisms is the need to define and enforce standards for “good CO₂ removal”. The documents suggest that the credibility and sustainability of a voluntary carbon removal market depend on creating robust certification frameworks to ensure that removals are genuine, additional, and measurable. This emphasis on quality is not just about compliance but also about building trust among market actors and avoiding accusations of superficial or ineffective practices.

Notably, the documents that were analysed operate within vastly different domains, linking carbon removal to agriculture, forestry, industrial policy, and beyond. Consequently, carbon removal is presented as a concept that undergoes several translations within its formulation in EU's industrial strategy, tying into diverse areas such as agricultural and forestry practices under carbon farming and more industrial approaches under capture and storage technologies.

The documents, therefore, assemble issues and actors from different networks, bringing together a complicated and yet unstabilised idea of carbon removal. These imported concepts create ambiguity, especially concerning whether carbon removal should be understood as storing carbon permanently or reusing it in other industrial processes.

The concept of circular carbon is enacted through a combination of existing infrastructures and practices, such as Horizon Europe's research programs, target-setting in regulations like LULUCF, and mechanisms like carbon credits and advisory services. There are also prospective practices tied to the development of new market devices, such as the envisioned Certification Framework, which would serve as a coherent system for managing and rewarding carbon removal efforts. This envisioned framework places particular emphasis on standardising the criteria for high-quality carbon removal. It aims to address concerns about the legitimacy of credits by distinguishing between genuine carbon removal practices and those that are superficial, inevitable under business-as-usual conditions, or otherwise unverifiable. By setting such standards, the framework seeks to ensure that the market can operate with integrity, building trust among buyers, regulators, and the public.

In conclusion, the documents show that the creation of a carbon removal market is not a straightforward task. It involves navigating overlapping market structures, dealing with ambiguities between public and private incentives, and integrating a range of socio-material practices. An additional layer of complexity lies in ensuring that these markets are built on a foundation of trust and transparency. The emphasis on quality, through mechanisms like certification frameworks, reflects the necessity of defining what constitutes “good” CO₂ removal (Asdal et al., 2021). By addressing these quality concerns, the market seeks to prevent “greenwashing” and establish a foundation for effective, measurable contributions to carbon removal efforts that align with both regulatory expectations and market actor demands.

7.2. Market Devices in Action

In the previous section, we explored how the concept of the CRCF emerged through a chain of interconnected documents, shaping the contours of a potential carbon removal market. In this section, we turn our attention to a set of specific mechanisms and regulatory processes that enable the creation and further stabilisation of this market-in-the-making. As we shall see, these processes are not merely passive implementations of policy, but active *market devices* that define the boundaries and conditions of market actors and shape the rules of engagement therein. By focusing on elements such as the preceding reports for the impact assessment reviewing carbon removal solutions and certification mechanisms, as well as public consultations, we will examine how regulatory tools function not just as bureaucratic formalities but as performative agents that construct the carbon removal market itself. This analysis will highlight how the CRCF, alongside related regulatory mechanisms, acts to consolidate various socio-technical networks into a coherent, actionable framework that aims to turn carbon removal from a policy idea into a structured economic reality.

Before delving into the functionality of these market devices, it is crucial to consider their origins, and the actors involved in their creation. Thus, I will first briefly introduce how regulatory processes are conceptualised at the level of Commission adoption, shedding light on the procedural steps and institutional mechanisms through which these market devices are formally integrated into the policy framework. Afterwards, I will provide important context for understanding how the involvement of external consultants intersects with the broader regulatory apparatus. As such, the reports, frameworks, and public consultations that underpin the CRCF were not solely the product of EU regulatory bodies but were developed in collaboration with a network of external consultants – the Environment Agency Austria, the Ecologic Institute, Ramboll consulting and Carbon Counts. These consultants played a central role in shaping the design and content of the market mechanisms. Their expertise informed the development of the tools and processes that ought to structure the development of a carbon removal market. Therefore, to fully understand how these devices operate as performative instruments, we

must first examine who produced them, what interests they represent, and how their involvement influences the overall framing of carbon removal as a market object. By doing so, we can gain deeper insights into the dynamics and knowledge flows that underpin the regulatory process.

7.2.1. Impact Assessments: A Brief Overview

To give a little bit of orientation, I shall shortly explain how the policy process develops in cases of legislative projects set by the EUCOM, before we analyse the practices that are used in this case. Figure 1 presents a stylised sequence depicting the process from the point where the Commission outlines a specific project to its entry into the legislative process, known as the trialogue, after being adopted by the Commission and forwarded to the European Parliament and the European Council. Once the European Commission, often through its Directorates-General, has prioritised a particular project – such as naming and defining certain priorities in strategy documents, as analysed in the previous section – the project is typically handed over to external services. These services assist in the preparation and consultation process for impact assessments, which are part of the commissioned projects. The impact assessments are designed to

“examine whether there is a need for EU action and analyse the possible impacts of available solutions. These are carried out during the preparation phase, before the Commission finalises a proposal for a new law.” (European Commission, n.d.-c)

Once a project is deemed applicable or necessary under the EU’s mandate, it not only establishes the problem framing but also outlines the governance approach to be taken. To support this process, the European Commission (EUCOM) frequently commissions external institutes, consultancies, and research organisations to contribute to various aspects of the legislative process. The rationale behind this is the specialised expertise these external actors provide. They prepare studies, expert opinions, and analyses on specific topics, drawing on their in-depth knowledge. Consulting firms and research institutes are commonly tasked with conducting impact assessments to evaluate the potential economic, social, and environmental impacts. Additionally, they often organise public consultations and stakeholder engagement processes, as well as analyse and evaluate the data collected from these activities.

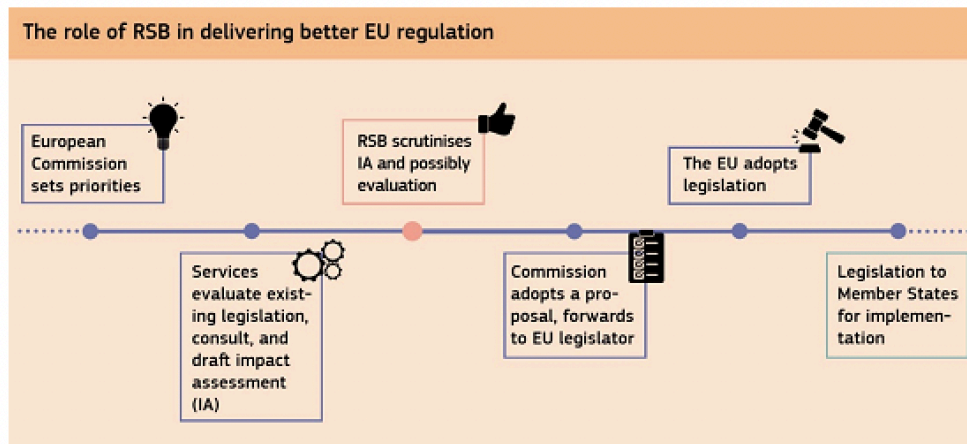


Figure 1 The role of RSB in delivering better EU regulation (European Commission, n.d.-d)

Once these preparatory assessments and consultations are completed, the relevant section of the Directorate-General submits a draft of the Impact Assessment report to the Regulatory Scrutiny Board. This board

“reviews and issues opinions and recommendations on all the Commission's draft impact assessments, fitness checks, and on major evaluations of existing legislation. The Board also provides cross-cutting advice on better regulation policy to the Commission's Secretariat-General.” (European Commission, n.d.-d)

As a result, the impact assessment undergoes a feedback loop within the Directorate-General (DG), allowing for adaptations and refinements based on the Board's recommendations. While the subsequent trilogue and implementation processes at the Member State level are important, they will not be discussed in detail here, as my focus is primarily on the process leading up to the publication of the actual proposal. At this stage, the Parliament, political groups, and the rapporteur take centre stage in the legislative process. However, for my analysis, it is crucial to examine which actors are involved in drafting the impact assessment, as this will shed light on the practices employed to generate the mandate and define the specific problem at hand.

7.2.2. Tracing the Actors Behind Impact Assessments

In the case of the CRCF, the Directorate-General Climate Action (DG CLIMA) under the leadership of ‘Unit C.3 – Land Economy and Carbon Removals’ contracted the Environment Agency Austria, as well as the Ecologic Institute, Ramboll Consulting and Carbon Counts for a 14-month service to conduct two assessment reports, of which one is a synoptic review of carbon removal solutions (Bey et al., 2021), and the other a review of carbon removal certification mechanisms and methodologies (McDonald et al., 2021). To get a grasp of how these organisations describe their own area of expertise, I shortly account for their self-

descriptions as given on their websites and output material. This contextualisation helps clarify the broader network of actors involved in the development of the CRCF, shedding light on how different forms of knowledge and institutional expertise are mobilised to legitimise and implement carbon removal strategies.

On its web presence, the Environment Agency Austria states that it “provide[s] the basis for decision-making and offer advice on forward-thinking approaches to meet the challenges at the environment/economy/society interface, on how to identify risks and how to use opportunities.” (Environment Agency Austria, n.d.) As a partner of the European Environment Agency and a member of the network of European environmental agencies as well as the network of European nature conservation organisations Environment Agency Austria regularly provides advice to the European Parliament and the European Commission. In this consortium, the Environment Agency Austria held the project management and coordinated the work of the assisting contractors.

Next to the EAA is the Ecologic Institute, which describes itself as “an independent, academic think tank for environmental research and policy analysis” (Ecologic Institute, n.d.). As a “not-for-profit” organisation based in Berlin and Brussels, most of its study projects are commissioned either by German ministries or parliament as well as EU institutions.

From what can be found on their online presentation, Ramboll Consulting works as a “global engineering, architecture and consultancy company, delivering expertise and sustainable solutions to clients and partners” (Ramboll, n.d.). Founded in Denmark, the Ramboll Group is mainly owned by the Ramboll Foundation. As portrayed on its website, the firm states to “bringing together [...] technical expertise, domain knowledge, and digital capabilities, [to] support our clients in driving improvement and developing new business models that are inherently sustainable.” (Ramboll, n.d.) In relation to the case at hand, Ramboll seems to have provided input to other assessments of the EUCOM in the context of CCS and CCU technologies and their regulatory context especially regarding the implementation of these technologies in the construction sector. (Turnau et al., 2019)

Last but not least, Carbon Counts describes itself as an “independent consultancy providing a range of advice in the field of climate change. It has a focus on international climate change policy, in particular technology development, deployment, financing and regulation.” (Carbon Counts, n.d.) Among its expertise it lists “climate and energy policy and legislation development” as well as “low carbon policy design, including carbon pricing, market mechanisms, emissions accounting, and measurement reporting and verification (MRV) methods and standards” (Carbon Counts, n.d.).

Together, they combine environmental policy, technical consulting, and regulatory knowledge to support the CRCF's development. As such, they were contracted to fulfil the following 5 tasks:

- “Task 1: Review of existing mechanisms for the certification of carbon removals
- Task 2: Synoptic assessment of technological and nature-based solutions for carbon removals
- Task 3: Organise expert workshop and provide support to stakeholder consultation
- Task 4: Support to assess options to design EU carbon removal certification mechanism
- Task 5: Support the design of a pilot phase” (European Commission, 2022d, p. 4)

The first 2 tasks, the review of existing certification mechanisms as well as the assessment of different removal solutions are captured in two accompanying reports to the official impact assessment. Let us thus start to open the books of the impact assessment and to analyse how these reports act as market devices in the enactment of a market for carbon removals.

7.2.3. Fiches as Mediators: Rendering Removal Solutions Equivalent

As previously mentioned, the two review reports have distinct focal areas. I will begin by analysing “Part 1: Synoptic Review of Carbon Removal Solutions” (Bey et al., 2021). This initial synopsis report aims to review “existing solutions for (...) removals, covering both nature-based solutions (NBS) and technology-based solutions (TBS)” (p. 6). Notably, the report does not reference the Circular Economy Action Plan, the Farm to Fork Strategy, or the Sustainable Carbon Cycle Communication. Instead, it sets the stage for its introduction by referencing three other documents: the Commission’s long-term strategy document “A Clean Planet For All” (European Commission, 2018), which outlines the ambition to achieve climate neutrality by 2050 and serves as a cornerstone of the “European Green New Deal” (European Commission, 2019), later enshrined in Article 2 of the “European Climate Law” (European Commission, 2021b).

This is particularly interesting because the assessment report authors focus on how the strategy document “A Clean Planet For All” incorporates removal solutions into its scenario-based assessment. They observe that while all projected scenarios anticipate significant gross emissions of greenhouse gases in 2050, there will be a demand for negative emissions from either the LULUCF sector or so-called removal *technologies*. However, the scenarios outlined in the 2018 strategy document only consider BECCS and DACCS as technological options, alongside CCS for fossil CO₂ emissions.

The report states that “scientists, landowners, and entrepreneurs have identified and developed various nature-based (NBS) and technology-based (TBS) carbon removal solutions”

(Bey et al., 2021, p. 11). The aim of this review is to assess an expanded, yet 'prioritised' list of removal solutions based on their 'potential' and 'suitability'. This represents a significant departure from previous official assessments and projections by the European Commission, as it seeks to establish a broader evaluation of removal solutions.

This raises important questions: How is the prioritisation conducted, and how is their potential and suitability evaluated? Potential is defined as the "solution maturity, estimates of carbon removal potential (tCO₂-e), solution costs, practical challenges to deploy the solution at large scale, and permanence aspects of carbon removals delivered by the solution" (Bey et al., 2021, p. 12).

To assess the individual solution suitability, the authors state to have investigated "among other aspects: existing Monitoring, Reporting & Verification (MRV) frameworks dealing with the solution, solution co-benefits and potential negative externalities, and the scale of projects implementing the solution" (Bey et al., 2021, p. 12). In other words, the report aims to assess their mitigation impact as well as their appropriateness for widespread implementation in Europe.

But which solutions are considered at all? The process of prioritisation remains somewhat opaque. The report states to have 'short-listed' a number of 12 solutions from a 'long-list' – which is not presented in detail in the report. The criteria for their pre-selection would have been their global carbon removal potential, their technological feasibility, availability of data and knowledge, their practical feasibility, as well as the degree of permanency of the removals and their costs (Bey et al., 2021, p. 13).

Figure 2 included from the report shows a mapping of the reviewed solutions, differentiating NBS and TBS according to the CO₂ storage sphere they enhance (geosphere, biosphere, technosphere), as well as to the CO₂ source they rely on (atmospheric carbon, biogenic carbon & fossil carbon).

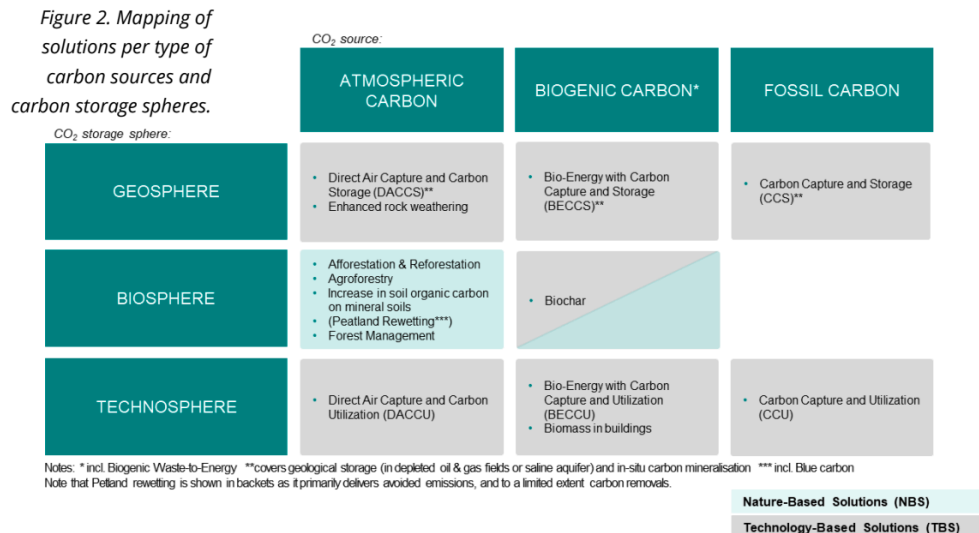


Figure 2 "Mapping of solutions per type of carbon sources and carbon storage spheres." (Bey et al., 2021, p. 17)

While I won't delve into the specifics of each category or individual solution, it's important to highlight that the report acknowledges that these classifications come with uncertainties and doubts. For instance, it categorises 'Peatland Rewetting' as a nature-based solution that captures atmospheric carbon and stores it in biospheric matter, while also including *blue carbon solutions*, defined as "carbon captured and stored by coastal ocean ecosystems, including salt marshes and estuarine wetlands" (Bey et al., 2021, p. 14). The authors note that, due to perceived 'similarities' and 'overlaps' between peatland rewetting and blue carbon solutions, as well as the "relatively underdeveloped European knowledge base on blue carbon" (Bey et al., 2021, p. 14), these solutions are assessed together under one category. Ocean fertilisation, another so-called blue carbon removal solution, is excluded in this category and the related assessment, because of the maturity of the solution as well as the limited availability of data.

Notably, the report captures in a footnote that 'Peatland Rewetting', however, "is shown in brackets as it primarily delivers avoided emissions, and to a limited extent carbon removals" (Bey et al., 2021, p. 16). Thus, this example is telling for the uncertainties and only conditional nature of the category building for removal solutions. While, in 'real-life' conditions, these solutions might not stand the test to qualify as a similar type of process or a 'real removal' the report finds ways to group them according to quite flexible conditions. This shows how the assessment report attempts to classify carbon removal methods, but in doing so, it merges distinct solutions based on perceived similarities, despite significant differences in their knowledge base and practical implementation.

Another example of this type of strategic ignorance (McGoey, 2012) is the listing of 'Carbon capture and storage (CCS)' and Carbon capture and utilisation (CCU)' as evaluated solutions

for fossil carbon as you can see in Figure 2. While declaring in a footnote that “strictly speaking CCS typically only involves capture and storage of CO₂ from (fossil) point sources, not directly from the atmosphere” (Bey et al., 2021, p. 16), it is included in the assessment as it ought to serve as a benchmark for the assessment of DACCS and BECCS as removal technologies, mostly due to their storage capacities and the issue of their ‘permanence’ or ‘reversibility risk’. Similarly, CCU is said to be included, because it would be “crucial to identify the relevant baseline and the additionality criteria applied to avoid putting the label of being a ‘carbon removal solution’ on a technology that might at best only be short-term net-zero” (Bey et al., 2021, p. 16)

This selective inclusion, while acknowledged, reflects a strategic choice to present these technologies as relevant in the broader conversation on removals, even when their actual contribution to long-term carbon storage must be rejected. In this way, the report blurs the distinctions between considered removal solutions and those that are more accurately categorised as mitigation technologies. Ultimately, this approach to classification influences the discourse on carbon removal, shaping policy recommendations and investment priorities by implicitly framing technologies like CCS and CCU as more integral to carbon removal efforts than they may technically or practically be. These instances portray, why review reports like the ones at hand represent important resources for understanding how decisions about the inclusion or exclusion of certain solutions, as well as their groupings are practiced within this process of shaping a regulation on removals.

How, then, does the report go about assessing a list of diverse removal solutions, each of which can be understood as a container that often includes various (sub-)solutions? To manage this complexity, the report employs a table as a heuristic tool, designed to present and organise each selected category of removal solution for assessment. A template of this so-called ‘fiche’ is displayed in Figure 3. This fiche format structures the information by focusing on two overarching aspects: the *potential of a solution* and its *suitability* for deployment. These fiches serve as the foundational basis for conducting a techno-economic assessment and comparison of the different solutions.

6 ANNEX 2 - SOLUTION FICHE TEMPLATE

Table 4 Solution fiche template

Solution fiche template	
Section	Aspects covered
Descriptive/context	
Solution name	Name
Introduction	- Brief description of the technology - GHGs targeted (and land use category, if appropriate) - Examples of solutions already operational or in planning
Potential	
Technology readiness level (TRL)	- Current TRL level - Qualitative discussion of development (e.g. expected TRL level by 2030, 2050, development risks, uncertainties)
Carbon removal potential	- Technical and/or realistic potential (i.e. t CO₂-e removals, global, Europe-wide, annual – now, future) and total potential removal - Constraints/interaction effects and assumptions (e.g. land use requirements, contingencies reg. other solutions) - Brief description of calculation method and uncertainties - System boundaries and lifecycle emissions considerations
Costs	- Current costs (i.e. overall €/t CO₂-e including CAPEX and OPEX costs) - Projected future costs - Energy demand
Duration of removals / permanence	- Duration of removals & risks of reversibility - Conditions for permanence and options to manage impermanence
Practical barriers	Are there other barriers that would limit the wide-scale uptake/ implementability of this solution (e.g. legal, land area requirements, public acceptance, ownership, economic considerations etc.)
Suitability	
MRV	- Qualitative discussion and critical assessment of MRV, and uncertainties - Baseline setting methods (including existing baseline data options) - Key references (to existing MRV frameworks)
Co-benefits and negative externalities/leakage risks	- Co-benefits (e.g. downstream productivity benefits) and negative externalities (e.g. biodiversity impacts, water quality/quantity impacts), - Understanding of side effects/leakage risks
Governance aspects	- Actors involved (i.e. sectors and if available, examples of organisations) - Scale/size of projects - Linkage to existing policies and measures/strategies/funding schemes (e.g. CAP)
Existing certification mechanisms	Is this technology already applied under existing certification mechanisms? Reference to fiche, or short description.

Figure 3 "Solution fiche template" (Bey et al., 2021, p. 124)

The authors state that they used existing scientific and grey literature, focusing on available metastudies that covered several carbon removal solutions. Where necessary, they supplemented this with scientific papers and other publications on individual technologies. Given the rapid development of the field, they deemed it necessary to adopt a ‘snowballing’ approach, continuously adding to the list of literature while drafting the assessment. Additionally, the authors gathered feedback from experts through polls and open discussions about the challenges of certifying these solutions (p. 16).

This methodology highlights the challenge of generating consistent knowledge across various solutions. In most cases, the level of knowledge for different methods is uneven. While extensive data from established practices, such as afforestation, is available, knowledge for technologies like BECCS, DACCS, or biochar is limited to project-related applications, many of which have not yet achieved large-scale technical deployment. Consequently, estimates from various sources show wide variations for individual solutions, particularly in terms of costs (current vs. projected) and removal potential. Removal potential is defined as “technical and/or realistic potential (i.e. t CO₂-e removals, global, Europe-wide, annual – now, future) and total removal potential” (p. 123). Notably, much of the data for novel solutions comes directly from

the project developers themselves. Even with these variations, the data are consolidated in a comparative table that contrasts the detailed information from the individual profiles. An excerpt from the table showing the shortlisted methods analysed – here focusing on NBS – is presented in Figure 4.

Solutions	#1 – Afforestation & Reforestation	#2 – Agroforestry	#3 – Peatland re-wetting (also covering Blue Carbon)	#4 – Forest management	#5 – Increase in soil organic carbon on mineral soils	#6 – Biochar
Project size	Wide variety of project sizes (from <5ha to 1000s of ha). Average project size in the UK quality assurance standard for woodland creation, "Woodland Carbon Code", is 50ha, with expected total sequestration over 100 years of approx. 19,000 t CO ₂ -e	Carbon impact per ha and per farm are relatively low (sequestering between 0.09 and 7.29 t C/ha/yr; average EU farm size of 16.6ha).	MoorFutures has projects that range in size from 6.7ha (5800 tCO ₂ -e over 100 year life of project) to 68ha (39500t CO ₂ -e over 100 year life of project) (all avoided emissions, not removals). Per ha avoided emissions of 3.5-24 t CO ₂ -e/ha/yr	On average, forest management in Europe could deliver 0.9-2.5 t CO ₂ per ha per year in increased sequestration Forest plot sizes: many 10-500ha, many greater than 500ha). 500ha = 500-1250t/yr.	Depends on farm size. 0.5 and 7 t CO ₂ per ha per year, on average. In European context, likely to be anywhere from 10-15ha to several hundred hectares.	Information not available.
Cost ¹⁴ (EUR/tCO ₂)	EU: Approx. 25Mt CO ₂ /y sequestration at €50/t and approx. 40Mt CO ₂ /yr at €150/t (EU)	Very little clear evidence available. Costs differ per specific agroforestry system, the extent of tree planting and local context.	Global: 10-100 USD (2030) EU: 75% of carbon impact from retiring EU croplands on organic soil at costs of € 20/t CO ₂ -e	Consistent evidence on costs in Europe were not found. Costs are variable.	Cost-effectiveness will vary significantly depending on the regional potential. International estimates find 20% reductions at negative costs, the rest at under 40 USD.	90-120 USD, though high range and uncertainty regarding costs (due to diverse biomass sources, and limited evidence on application).

Figure 4 "Summary table of synoptic assessment of short-listed NBS (and Biochar)" (Bey et al., 2021, p.21)

Looking at these activities in the broader context of creating a certification framework, the first step of the report is to assess which solutions are eligible or recognised for certification. The report expands the set of solutions considered by the EU's existing projections. As observed in the document, these solutions are not predefined categories but must be established during the assessment process. Some are more clearly defined than others, some are grouped together during the process, and dependencies between certain solutions (e.g., CCS/CCU, BECCS, and DACCS) are either produced or reinforced through this process. Existing knowledge from metastudies, individual technology reports, and project developers' data helps form rough estimates of which parameters must be considered for each solution. In some cases, such as ocean fertilisation, knowledge gaps lead to the exclusion of solutions, while similar gaps reappear in the assessed solutions (as shown in Figure 4).

The report's analysis underscores the complexity of consolidating various carbon removal solutions into a framework suitable for certification. Notably, it concludes that there is no clear "best" solution, but rather a spectrum of options with differing advantages and limitations, which must be carefully considered in developing certification frameworks. The comparison of solutions shows significant variations in maturity, cost-effectiveness, carbon removal potential, permanence, and associated risks. Nature-based solutions, while generally more mature and cost-effective in the short term, would pose greater risks in terms of permanence and reversibility. Additionally, the quantification of removals is often less robust for NBS compared to TBS.

These findings imply that the evaluation criteria must reflect these differences, though doing so complicates the development of holistic recommendations (Bey et al., 2021, p. 6).

The report's analysis underscores the complexity of consolidating various carbon removal solutions into a framework suitable for certification. Notably, it concludes that there is no clear "best" solution, but rather a spectrum of options with differing advantages and limitations, which must be carefully considered in developing certification frameworks. The comparison of solutions shows significant variations in maturity, cost-effectiveness, carbon removal potential, permanence, and associated risks. Nature-based solutions, while generally more mature and cost-effective in the short term, pose greater risks in terms of permanence and reversibility. Additionally, the quantification of removals is often less robust for NBS compared to TBS. These findings imply that the evaluation criteria must reflect these differences, though doing so complicates the development of holistic recommendations.

Moreover, the analysis highlights discrepancies in the delineation and system boundaries used to account for carbon removals, making direct comparisons challenging. For instance, in afforestation and reforestation projects, the mitigation impact is determined by factors like biomass accumulation, dead organic matter, and changes in soil carbon. In contrast, enhanced rock weathering (EW) introduces a different set of considerations, such as emissions from mining, rock grinding processes, and transportation, all of which affect the carbon balance. EW also faces temporal challenges, as the net carbon removal effect may take decades to become positive, depending on variables like the particle size of the ground material, the use of renewable energy in processing, and transportation distances. These discrepancies illustrate how differing system boundaries and lifecycle emissions can complicate efforts to create uniform evaluation standards across solutions. Costs are another point of uncertainty, as they are often poorly defined in terms of scope, timing, and attribution. The significant expenses associated with robust monitoring, reporting, and verification (MRV) of carbon removals must also be factored in.

All of this exemplifies the required and yet unresolved effort to bind a bouquet of different carbon removal solutions together in a form that allows for comparison and analysis – and for potential consideration and uptake under the first European regulation on removals. At the same time, it becomes evident that the science on the long-term effects of individual solutions is still in its early stages, with insufficient evidence to draw definitive conclusions. In this context, the project advances not by prioritising specific solutions as particularly eligible but by opting for an open “portfolio” approach (Schäfer & Bright, 2024). Through market-based incentives, it aims to encourage broader participation and innovation. However, this raises critical questions about which solutions will realistically emerge as viable and what kinds of methodologies will need to be developed to adequately assess and certify them.

7.2.4. Standardising Certification Mechanisms for Comparability

Building on the findings of the first report, which highlighted the complexities of comparing various carbon removal solutions, the second report shifts attention to the critical role of certification mechanisms in ensuring the credibility and scalability of these solutions. As the European Commission develops its own certification framework for carbon removals, this report examines existing mechanisms designed by both public and private actors to regulate activities that impact the carbon cycle. These mechanisms not only define the rules and methodologies for verifying carbon removals but also aim to ensure that such removals are real, measurable, additional, and permanent. By analysing how different certification systems function, the report sheds light on the governance structures, approval frameworks, and control mechanisms that are essential for creating a framework for carbon removal in Europe. I think it is crucial to understand how these mechanisms are assessed in practice in this report. The report defines them as follows:

“Certification mechanisms for carbon removals or mitigation typically provide a set of rules, procedures and requirements for a range of eligible activities in order to verify that they have reduced emissions or removed GHGs through sink enhancements and are eligible for certification/payment. These mechanisms have two main objectives: first, to ensure that carbon credits are real, measurable, additional, not resulting in leakage, not double-counted, and permanent; second, to achieve wide scale uptake and implementation, so as to maximise potential impact on the climate.” (McDonald et al., 2021, p. 12)

These mechanisms can be viewed as the “trust infrastructure” that underpins carbon markets, facilitating confidence among stakeholders – including investors, policymakers, and the public – that carbon removals are genuine and effective. They include both the specific methodologies “for quantifying and certifying on-the-ground carbon mitigation/removals” (McDonald et al., 2021, p. 12), as well as the mechanism architecture, which specifies the rules to approve or modify those methodologies. The mechanisms discussed in this report are thus precisely the heterogeneous market infrastructures (as discussed in Section 2.4.) that emerged with the commodification and marketisation of carbon dioxide in different scales and regions. From an STS perspective, these systems need to be viewed as distinct cultural, technological, and political assemblages (Myers et al., 2018; Schumacher, 2023), as each establishes specific rules and practices that shape the dynamics of carbon certification and verification.

Upon examining the assessment reports, it becomes apparent that most existing mechanisms were originally developed with a primary focus on emissions reduction rather than carbon removal. For example, activities like afforestation and reforestation, historically framed as

emissions reduction measures, are now being reconsidered in the broader context of removals. This observation highlights how certain nature-based removal solutions have long been integrated into emissions reduction toolkits, meaning that methodologies for quantifying and certifying these solutions already exist within several of the examined mechanisms. Beyond these, the documents also identify mechanisms and methodologies developed more recently to assess novel removal activities, such as “Nori Carbon Removal”. The practical challenge that the report addresses is to analyse the existing mechanism architectures and their associated methodologies in order to make them productive for the development of a European mechanism. Let us explore how this can be done.

Some elements of this translation are already known. To aggregate information and conduct individual assessments, the consortium once again develops detailed 'fiche'-templates for both the individual mechanism architectures and the specific methodologies. These fiches will then be compared in a consolidated table that presents key information. The report states that the goal of this comparison is to “identify key lessons related to mechanism design” (McDonald et al., 2021, p. 8) and to “[evaluate] a range of options for the EU certification mechanism” (p. 9).

Interestingly, the report identifies a total of 12 certification mechanisms and 12 methodologies, echoing the number of assessed solutions in the first report. This claim may be justified individually but underscores the document's purpose to present a diverse array of solutions, mechanisms, and methodologies in a comparable and systematic manner as possible. Thus, it is crucial for us to analyse how this selection occurs and how a systematic framework within the documents allows for the identification of “a range of options”.

According to the document, this process unfolds in four steps: first, existing mechanisms were identified and prioritised; second, a fiche template was developed for both mechanism architecture and methodologies, which were then populated through research using available information and subjected to quality assurance. This research consisted of desk research from academic and grey literature, with findings validated through external reviews, including roundtable discussions and consultations with mechanism administrators, as well as “at least three rounds of quality assurance, including review by senior project team members and the European Commission” (McDonald et al., 2021, p. 15).

Again, the report does not disclose how the initial identification of mechanisms and methodologies occurred – the so-called “long list.” Without knowledge of how many were initially considered, the authors note that 25 mechanisms and methods were selected for further analysis. Notably, the selection aimed to encompass all “major NBS and TBS” (p. 14) solutions, as well as various “governance scales and approaches (including voluntary and regulatory, project-based, jurisdictional, and national scales)” (p. 14). In cases where multiple mechanisms or

methods were available for the same solution, the prioritisation was based on the sophistication of the MRV system and the respective market size and maturity.

As in the first report, two fiche template were subsequently developed – one for the mechanism architecture and one for specific methodologies (see Figure 5 and 6). According to the report:

“The fiche template covers all aspects of the certification mechanisms that are relevant for understanding how the certification mechanism works, as well as background information to enable contextual understanding.” (McDonald et al., 2021, p. 14)

The fiche for the mechanism architecture focuses on high-level characteristics, while the methodology fiche outlines specific techniques within these mechanisms for individual solutions. As discussed in the previous sub-section, this stage identifies the parameters relevant for analysing carbon certification mechanisms and the methodologies underlying them.

Table 3. Mechanism architecture fiche template

Mechanism architecture fiche template	
Section	Aspects covered
Descriptive/context	
Scheme name	Name
Introduction	- Context: context of the mechanism (including maturity) - Brief description of the mechanism
Governance	Operator/administrator: Regulatory or voluntary mechanism: Methodology development process summary (including summary of bottom-up procedures) Key governance bodies: (list/describe key governance bodies)
Participants	Supply side: (i.e., who generates removals, what types and size of participants are involved) Demand side: (i.e., who pays for the removals e.g., buys credits, or funds removal actions)
Scope, objective, and eligibility	Carbon removal solutions: /projects (incl. development of new methodologies) (i.e., what types of removal solutions are covered – what source of CO₂ and what type of sink/end-use?) Geographic eligibility: (i.e., where can projects occur, scale of projects)
Performance	Number of registered carbon removal methodologies Number of registered carbon removal projects Number of participants (if possible) Quantitative information on carbon dioxide removals under the mechanism (tCO₂-e) - Trends, developments
Core design decisions	
Cross-cutting MRV aspects - high-level	MRV cycle or Quantification: an overview of how quantification of removals is done (what are the steps). Additionality approach (i.e., how do we know that these actions (and the removals) are additional to what would have happened anyway? e.g., what is the baseline, how is it set, how does it interact with existing regulatory compliance, financial additionality) - Baseline: (Historical or Scenario (i.e., historical baseline based on historical data OR a future scenario). Identify historical data included (i.e., how many years of data). Or what is included in the scenario; Specific or standardized – i.e., is the project specific to the participant or standardized across multiple participants. - Fixed baseline or dynamic or revised) Treatment of uncertainty (here you might have to check one or two methodologies to get an idea) Permanence, carbon reversals, and liability Reporting requirements (frequency/duration, differentiation, transparency) Verification procedure and bodies (and timing)
Accounting	GHG registries and integration in GHG inventories; transparency (i.e., is there a public registry to record removals and transactions to avoid double counting; are international trades allowed and if so how are these recorded)

Figure 5 "Mechanism architecture fiche template" (McDonald et al., 2021, p. 158)

Regarding the methodologies, the report notes that these details are used to assess whether the activities measured can be considered of 'high environmental integrity' ("i.e., real, permanent, additional, avoiding leakage and double-counting" (McDonald et al. 2021, p. 38). This includes details such as the scope of the methodology (the specific solution being measured), the land-use category, the greenhouse gases involved, and the definition of system boundaries. Particular attention is also paid to criteria related to the MRV approach, unless these aspects are thoroughly covered by the overarching mechanism architecture fiche.

While the methodology fiche mainly aggregates information available in the documents from developers or the implementing authority, the mechanism architecture fiche integrates

additional contextual information and a section on "incentives/market elements". In this context, it outlines governance details (such as whether the mechanism is regulatory or voluntary and how the methodology development process is structured), details on participants (divided into the 'supply' and 'demand sides'), and the performance of the respective mechanism. The section on "Incentives/market elements" includes criteria such as transaction and administrative costs for stakeholders or administrators, the type and timing of rewards, and the use of the removal units or certificates generated within these mechanisms.

Each of these criteria could merit its own empirical study, and many of these aspects have already been explored by other scholars (Liu & Cooper, 2020). However, for my analysis there is less focus on how the mechanisms and methodologies are categorised in the fiche for each example. What is more intriguing here is to consider how this information interacts and what specific function its arrangement within the document serves.

The development of the fiche template in the report reflects several overarching aspects, both in its approach to integrating knowledge and in the way it presents its findings. The report, in many ways, acts as a "working document" – it displays certain facets of the processes involved in certification mechanisms, yet conceals others. This selective reflexivity hints at the dual nature of the report: it serves as a record of progress while simultaneously shaping a narrative of certainty and coherence around inherently complex and uncertain systems.

Table 4. Methodology fiche template

Methodology Fiche	
Fiche section	Aspects covered
Methodology document	For the methodology fiche, we will often principally be referring to the methodology document itself. Accordingly, provide a full reference to the methodology up front (including link) – as well as a full reference in the endnotes. In the rest of this methodology fiche, include specific page references to help later reader navigate quickly to the correct section of the methodology. e.g., ... (p. 26).
Mechanism architecture overview	- Summarise mechanism architecture elements here, as there is no accompanying mechanism architecture fiche. The methodology fiche follows. <i>(Note: This only needs to be included for methodologies that do not have a mechanism architecture fiche. e.g., MoorFutures. If a mechanism architecture fiche has been completed, please reference it here. e.g., See Fiche 01 CDM for more information on the overarching mechanism. Here, briefly summarise the mechanism architecture information (max ¼ page)</i> Overview and performance: Governance: Market:
Methodology scope	Specific removal solution covered: Land-use category: (include if appropriate. use land use categories from IPCC (i.e., from here: https://www.ipcc-nggip.iges.or.jp/public/2019rf/index.html) Carbon pools: (Use IPCC guideline categories: https://www.ipcc-nggip.iges.or.jp/public/2019rf/index.html) GHGs affected: System boundary: (Whole of unit/part of unit (i.e., whole farm or part of farm, whole of TBS site/part of TBS site) - Are lifecycle elements included? - Are any relevant gases and carbon pools excluded?)
Solution	- Name the solution that the method applies to. And provide a link to the relevant IPCC guidelines for national GHG inventories. - e.g., Peatland rewetting - covered by 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands
MRV aspects	Description of specific MRV procedures and methods related to the methodology: Quantifying removals/emissions (including comparison to IPCC guidelines (tiers), Uncertainties Reporting requirements e.g., what data to collect, timing, how to report Verification and validation (who, impartiality assessment, etc.) Specific additionality elements (how baseline is set; leakage) Co-benefits/externalities <i>Note- if this information is covered in the mechanism architecture fiche, can be skipped.</i> <i>Include links to more information and full references</i>
Permanence	Specific management of impermanence risks (intentional reversal risks and non-intentional reversal risks)
Key references	Key references (other than the methodology itself)

Figure 6 "Methodology fiche template" (McDonald et al., 2021, p. 160)

One notable aspect is how the report deals with uncertainty, particularly in relation to costs. Rather than viewing uncertainty as an obstacle, the report finds ways to make it productive. For example, projected costs are often used instead of current figures, allowing expectations and future scenarios to be incorporated into the current analysis. This technique turns uncertainty into something calculable - allowing the authors to present projections as actionable data, which fits into the broader narrative of certainty that the report seeks to maintain.

Moreover, the report's use of grey literature raises questions about the sources of knowledge it relies on. Grey literature, often consisting of operator knowledge or reports from mechanism administrators, introduces another layer of reflexivity. While these sources are valuable for

capturing on-the-ground insights, they also carry their own biases, potentially influencing how certain mechanisms are framed. The inclusion of such literature reflects an embedded tension: the report seeks to be both comprehensive and concise, integrating a variety of perspectives without always acknowledging the limitations and partiality of these sources.

This balance between detail and concision is particularly evident in the way the report structures its analysis. The repetition of precise figures - such as each fiche being five pages and each object of study having twelve items - implies a methodical, almost formulaic approach to presenting its findings. This calculated presentation gives the report an air of authority, but also highlights the constructed nature of the analysis. The mechanisms and methods examined are broken down into discrete variables, which are then aggregated, isolated and compared - leading to the assembly of these variables into preferred configurations. This process gives the impression of careful selection, where only the most robust mechanisms are considered, when in fact the desk research is constrained by the limitations of the available data and the framework it seeks to establish.

This method of assembling variables and methods mirrors the challenges described by Pfothner and Jasanoff (2017) in their work on innovation models. Just as innovation models often require extensive work to translate into new contexts, the architecture of carbon market systems presents its own challenges. Carbon markets are socio-material infrastructures that have evolved over time, with layers of complexity that resist simple transplantation. The report attempts to make mechanisms portable across contexts by breaking them down into modular components, but the question remains whether this knowledge will be productive in forging a truly novel and effective framework. In their article, Pfothner and Jasanoff suggest that “the ‘successes’ and ‘failures’ of innovation models are not a matter of how well societies are able to implement a sound, universal model, but more about how effectively they articulate their imaginaries of innovation and tailor their strategies accordingly.” (Pfothner & Jasanoff, 2017, p. 783 f.)

As such, the assessment report concludes that the evaluated mechanisms all vary significantly in both governance and geographical scope. Some are privately operated by independent organisations, while others are established by national public bodies. These mechanisms would also differ in the range of removal solutions they offer—some are specialised in methods like afforestation, reforestation, or peatland rewetting, while others cover a broader array of mitigation and removal methodologies. Viewed from a market perspective, privately operated mechanisms would generally issue offset certificates for voluntary markets, whereas publicly operated mechanisms are integrated into national emissions trading schemes or utilise government-led instruments like reverse auctions. Additionally, the scale of these mechanisms ranges widely – from small local initiatives with a

handful of projects to expansive national and global programs involving thousands of participants and the removal or mitigation of hundreds of millions of tons of CO₂.

Ultimately, the report uses these findings to advocate for a unified reference framework that can integrate all major nature-based and technology-based removal solutions. This would allow for greater comparability and coherence, despite the diversity of approaches currently in place. In the Impact Assessment Report the European Commission states:

“New global standards to define the quality of carbon certificates are emerging: these initiatives may contribute to address this problem to some extent. However, these approaches alone cannot address the EU’s needs for carbon removal certification. First, their scope includes emission reductions and does not comprehensively cover all carbon removal solutions. Second, as those approaches do not include an effective and enforceable governance, they do not offer sufficient guarantees for an impartial standard setting and may also be driven by commercial interests. And third, they do not necessarily reflect the environmental, socio-economic and regulatory context of the EU.” (European Commission, 2022c, p. 5)

Based on this problem definition, the Impact Assessment consequently outlines as its objective a framework of the four assessment criteria already described in the Introduction (Section 1.1.). With reference to the second assessment report, the Impact Assessment report forms a rhetorical cornerstone of its overall strategy:

“To harmonise the way in which the four certification challenges identified above are addressed, the framework will promote existing best practices through the establishment of four certification criteria (under the acronym QU.A.L.ITY): QUantification, Additionality and baselines, Long-term storage, and sustainabIlITY. The shortlisting of these four QU.A.L.ITY criteria follows a general consensus about what constitutes high-quality certification *according to most existing certification methodologies analysed in the study supporting this Impact Assessment (...).*” (European Commission, 2022c, p. 13, *emphasis added*)

In this way, we see how the second assessment report makes its way into the Impact Assessment and eventually into the final version of the proposal. Through a detailed analysis of existing certification mechanisms, four key criteria are ultimately derived to form the foundation of the new European framework. Notably, neither the Impact Assessment nor the proposal provide specific details on how these individual criteria will be made operational within the framework. In this sense, it can be assumed that this step primarily serves to reinforce the narrative of a trustworthy and harmonised framework.

Interestingly, some aspects of the analysed mechanisms, particularly those related to governance and the market structure in which the certification framework is expected to operate, are not addressed in this schematic approach. To understand how this process continues to unfold, we must look at other parts of the regulatory process in the next chapter.

7.2.5. Consultation Strategies as Market Devices

In the previous chapter, I analysed the development of crucial parts of the Impact Assessment as well as the respective proposal for a certification framework for carbon removals, drawing on two assessment reports. These reports were treated as distinct market devices, each enacting a variety of options for the potential certification framework through their evaluation of removal solutions and certification mechanisms. However, the process of constructing a carbon removal certification framework extends beyond these technical evaluations. In the case of the CRCF, it also involves the active outreach and participation from a wide range of stakeholders to shape how carbon removal will be formalised regulation.

It is worth recalling that one of the key tasks assigned to the external consortium was to “[o]rganise expert workshop and provide support to stakeholder consultation” (European Commission, 2022d, p. 4). I argue that the public consultation conducted under this mandate functions not merely as a feedback mechanism, but as another market device – a tool that actively shapes how carbon removals activities are constructed, regulated, and understood, particularly in relation to the concept of a market.

Thus, this section transitions from a focus on the assessment of carbon removal solutions and certification mechanisms to the consultation strategy that underpins the formation of the certification framework. By analysing how the public consultation strategy is designed and deployed, we can understand the ways in which it enrolls actors, translates their interests, and stabilises a particular form of market design.

Assembling a Consultation Process

The Call for Evidence was a 12-week public consultation with the “Certification of carbon removals – EU rules” (European Commission, 2022a, p. 1) as its title, which ran from February 7, 2022, to May 2, 2022. During this period, feedback was collected through an online survey consisting of 11 multiple-choice questions. These questions were designed to capture the views of a wide range of stakeholders, covering key topics such as the challenges in integrating carbon removals into EU climate policy, the criteria for certification, and the role of the EU in establishing these standards (cf. Annex 11.2.). Participants were also given opportunities to provide open-ended responses and upload position papers to further elaborate on their views. The summary report (European Commission, 2022b) of the Call for Evidence notes a total reception of 396 valid replies, with responses coming from a diverse array of actors.

While the 12-week feedback period is the focus of my analysis, it's important to note that the consultation was part of a broader engagement strategy, which, as described in the Call for Evidence and detailed in Section 5.2., also included an expert survey in 2021, an online conference in January 2022, and ongoing reviews of stakeholder documents, even after the release of the final proposal.

Notably, these activities are part of a set of instruments, embedded in the context of the EU “Better Regulation Agenda” (European Commission, 2021c) to enhance the quality and transparency of regulatory processes. As such, these consultations are positioned as tools to enhance the quality and transparency of regulatory processes. I will not go into the details of the agenda here, as it involves a set of different elements and would be a study of its own, but I will just shortly flag, which role the agenda sees for stakeholder involvement. The communication on the Better Regulation Agenda from the commission holds:

“Good policymaking involves those affected by the decisions. To sustain trust in the European Union, EU policies need to take into account and reflect the values and concerns of citizens. The active participation of stakeholders, including citizens, is essential – especially in times of uncertainty. At the same time, consultations should not impose unnecessary burdens. Therefore, we want to make it easier for interested parties to provide input through our consultations.” (European Commission, 2021c, p.4)

This agenda suggests a conceptual framework rooted in evidence-based policy-making, where the input of stakeholders – e.g. businesses, NGOs, citizens, and public authorities – are seen as crucial to shaping more effective and accountable regulations. However, the Better Regulation Agenda itself operates within a particular vision of governance, one that constructs public participation as a means of improving regulation through systematised feedback mechanisms. This conceptualisation assumes that participation and transparency are inherently tied to improved outcomes, yet the actual dynamics of how such input is translated into policy remain less visible. The process presumes that gathering evidence from a broad array of actors will necessarily result in more informed and responsive policies, although the ways in which different types of knowledge are weighted or filtered through this framework invite further scrutiny.

Setting the Frame

As with all documents, I will begin by examining how the specific documents related to the consultation process are assembled – namely, the questionnaire that was part of the Call for Evidence document, which informed and inquired participants about the regulatory proposal, and the summary report released by the European Commission (EUCOM) after the public consultation. Unfortunately, there is no original document available for the questionnaire itself,

as the survey was conducted directly through the European Commission's website and is no longer accessible. However, we can reconstruct the questions and answer options based on the Excel file that contained all the original input to the questionnaire as well as their presentation in the Impact Assessment report. My focus will be on how these documents introduce and frame the specific issue.

As stated in the Call for Evidence document, the overall goal of the proposal would be to help the European Union achieve its 2050 climate neutrality objective by upscaling sustainable carbon removal solutions (European Commission, 2022a). This objective aligns with the EU's broader climate strategy under the European Green Deal, which seeks to balance greenhouse gas emissions with removals, ultimately aiming for negative emissions. However, when addressing its target audience, the document emphasises the current shortfall:

“Currently the EU is not on track to deliver these quantities: carbon removals in natural ecosystems have been decreasing in recent years and no significant industrial carbon removals are currently taking place in the EU.

A major barrier to the upscaling of carbon removals is the lack of a common EU standard for the transparent identification of activities that remove carbon from the atmosphere in a sustainable way. Existing public and private schemes, such as in voluntary carbon markets, certify carbon farming practices but apply a wide variety of approaches to quantify their climate benefits. Industrial carbon removals are rarely addressed.” (European Commission, 2022a, p. 1)

Here, the Call for Evidence actively translates the findings of previous assessment reports into the outreach for the consultation. By referring to the inconsistent approaches in voluntary carbon markets and the absence of industrial carbon removals, the document not only points out technical and procedural gaps but also addresses the need for harmonisation across sectors.

Further, the document highlights the technical challenges facing carbon removal certification, stating that the process must contend with the risks of uncontrolled re-emissions, as well as difficulties in measurement and monitoring, particularly in natural ecosystems:

“The certification of carbon removals faces a number of technical challenges because carbon removals are at risk of uncontrolled re-emission as well as measurement and monitoring difficulties, in particular with regard to practices that sequester carbon in natural ecosystems. Carbon removal practices can show trade-offs as well as synergies with biodiversity and other sustainability goals. Moreover, different methodologies and standards may need to be devised for industrial carbon removals

and for ecosystem removals due to their different nature.” (European Commission, 2022a, p. 1-2)

So far, nothing new. This framing signals a need for differentiation between industrial and ecosystem-based carbon removals, reflecting the varying nature of these practices. The document thus positions the consultation as a key step in devising tailored methodologies for different types of removals. By presenting these technical challenges alongside the broader goal of climate neutrality, the Call for Evidence constructs the certification framework not only as a regulatory necessity but as a response to multiple, interrelated environmental and economic pressures, consolidating the justification for both the consultation and the eventual regulatory design to be carried out in a transparent, verifiable, and environmentally sound manner:

“The certification framework should identify the types of carbon removals to consider and set robust requirements for quality of measurement, monitoring, reporting and verification. It should ensure environmental integrity, in particular with regard to the EU’s ambition to reverse biodiversity loss and pollution, achieve credibility, and be socially acceptable to gain the trust of stakeholders and civil society.” (European Commission, 2022a, p. 2)

Moreover, it should be used to

“kick off the development of high-quality carbon removals over the coming years, the certification framework should facilitate more funding from private and public sources (e.g. voluntary carbon markets, private purchasing or investment initiatives, or public funding programmes).” (European Commission, 2022a, p. 2)

The emphasis on both market incentives and social acceptability suggests that the framework is not simply a technical apparatus for measurement and verification, but also a political tool designed to align carbon removal practices with the financial motivations of investors while also addressing public concerns around environmental impacts.

This dual orientation raises critical questions about how different publics are enrolled into this process, and how participatory mechanisms such as consultations serve to construct a particular kind of public that is expected to engage with these policies. Notably, this is the first instance in our analysis where the notion of a broader public explicitly emerges, particularly in reference to *gaining trust from civil society*, as mentioned in the Call for Evidence. In the earlier sections (especially Section 7.1.), we examined how specific actors were addressed – primarily businesses, investors, and technical experts – in the process of carving out a domain for the market. Here, this broader reference to civil society introduces a different dynamic, suggesting a more inclusive vision of the public whose trust and engagement is considered crucial to the framework’s success.

Additionally, by positioning the certification framework as a mechanism to unlock private and public funding, the Call for Evidence hints at the marketisation of carbon removal, where the value of these environmental interventions is made legible through certifiable units of carbon. Yet, this framing presupposes that market-based mechanisms, supported by robust regulation, will naturally lead to sustainable practices, leaving less room to consider how alternative models – e.g. ones less dependent on financialisation – might be marginalised or excluded from the conversation.

This bias toward market-driven solutions is underscored by the so-called *baseline scenario* presented in the Call for Evidence:

“Under the baseline scenario, the actors on the voluntary carbon markets continue to set their own standards.” (European Commission, 2022a, p. 2)

Here, the baseline depicts a world in which private actors dominate the regulatory space, setting their own standards with little coordination or oversight. The proposal’s goal of introducing common EU standards is positioned as a corrective to this fragmented landscape, but the implicit assumption remains that market mechanisms, once standardised, are the primary pathway to scaling up carbon removal efforts.

From here, the initiative outlines two key areas for the public consultation: It ought to assess, whether

“[a]n EU certification framework should set common minimum standards for the certification methodologies, including on monitoring, reporting and verification, or provide for comprehensive rules on the certification of each type of carbon removal. (European Commission, 2022a, p. 2)

As well as, whether

“The different functions, including the prior validation of projects and the subsequent verification of carbon removals achieved, should be carried out by private operators or by public authorities, possibly as part of a centralised EU system.” (European Commission, 2022a, p. 2)

By framing the problem in this way, the consultation establishes a clear set of priorities: the determination of the degree to which the EU should set the rules of certification – either minimum standards or comprehensive rules – as well as the governance structure for the validation and verification of carbon removals – either by private operators or by a public authority under the central authority of the European Commission.

In analysing the document surrounding the public consultation it becomes apparent that we are dealing with different notions of publics that all have their distinct roles and functions within

the consultation process. The consultation described in the Call for Evidence document reveals a duality in how it seeks to engage both a “general public” and a more specialised “target audience”.

In addressing the figurative question, “Why are we consulting?” the document explains:

“The Commission wants to ensure that the *general public* interest across the EU is well reflected by collecting feedback and gathering further information from public or private organisations and individuals. The results of the consultation will inform the Impact Assessment accompanying the Commission proposal on this initiative.” (European Commission, 2022a, p. 3, emphasis added)

At the same time, the initiative seeks to consult a specific *target audience*:

“The stakeholders identified are entities delivering carbon removals, including land managers, farmers, foresters and industrial companies operating the capture and storage of carbon; but also all potential purchasers of carbon removals, including companies in the food processing sector and digital technology sector, as well as public administrations in Member States interested in increasing carbon removals and the scientific community. Another group of stakeholders are those in existing voluntary carbon removal markets, e.g. certification bodies or financial agents traditionally supporting the land sector.” (European Commission, 2022a, p. 3)

This dual interest speaks to a complex balancing act: on the one hand, invoking a broad public interest to potentially legitimise the process as democratic, inclusive, and participatory, and on the other, focusing on the more specialised input from stakeholders who are directly involved in carbon removal activities or stand to benefit from its operationalisation as a market object. This specialised interest is also reflected in how, the document frames the potential benefits:

“The likely economic and social impacts can be positive for land managers, since removing carbon from the atmosphere on the basis of carbon removal certificates can be scaled up as a business model and will enable them to sustain their livelihoods in rural areas. Industrial companies can have greater opportunities to be rewarded for carbon removals of high quality and environmental integrity.” (European Commission, 2022a, p. 2)

The consultation, in this context, is framed as a participatory process, but the kinds of participation it encourages may be constrained by the specific objective it proposes to achieve. The framing of the overall problem, which was carefully established throughout the chain of documents we analysed before, and the specific objectives concerning the governance options

included in this consultation together build an initial step of translation for the enrollment of external actors to its script.

It now becomes necessary to examine how these actor groups, particularly those beyond the conventional market stakeholders, are enrolled in this part of the process. It suggests that the framework must also navigate the expectations and concerns of a more diffuse public, which may bring forward different priorities that are not always easily translated into the economic or technical language that dominates earlier parts of the consultation. Understanding how this broader public is conceptualised becomes critical in assessing how participation is structured as a market device in this regulatory process.

Constructing and Enrolling Different Publics

To analyse how the public consultation contributes to the construction of a public around the issue of CDR in the case of the CRCF, it is essential to examine how the design of the survey translates different interests into a specific set of actor groups to be engaged with. This involves looking at both the type and format of the questionnaire as well as how the results are later translated and presented in the summary report. By understanding this process, we can see how the consultation functions as a mechanism that organises and defines the boundaries of participation and representation for stakeholders involved in the certification framework. To begin, I will closely analyse the questionnaire given to external stakeholders as part of the public consultation on the certification framework, focusing on how it structures the issues at stake and the types of responses it anticipates from different actors.

Shaping Stakeholder Input: The Role of the Questionnaire

Participants were asked to respond to 11 multiple- and single-choice questions (For the complete list of questions from the Call for Evidence cf. Annex 11.2.), which were divided into four key sections: the scope of certification (Q 1-3), the perceived benefits of a certification framework (Q 4-5), the role of the EU (Q 6-7), and the technical details of certification methodologies (Q 8-11). Alongside these themed questions, participants were also given the option to provide additional comments in free-text fields and upload documents, which allowed for more detailed and original input (we'll have a closer look at these documents in Section 7.3.). Beyond these inputs participants were asked additionally to assert themselves to a particular actor category.

The first section of the multiple-choice questions addressed the *scope* of the certification framework, focusing on the perceived challenges of integrating carbon removals into EU climate policy (Q1: *What in your view are the main challenges regarding the integration of carbon removal in EU climate policies?*). Participants were also prompted to consider the main criteria that should define which types of carbon removals are incentivised under EU policy (Q2: *What should be the main criteria defining the types of carbon removals that EU climate policies should*

incentivise?). In Q3, respondents were asked to provide their opinions on various carbon removal solutions and the appropriate time frame for incorporating them into a certification mechanism. The solutions were categorised into carbon farming and industrial carbon removal methods. For each option, participants could choose a time frame from the following: as soon as possible, after 2030, by 2050, never, or no opinion.

The second section of the survey explored the supposed benefits of a yet to be established certification framework. Under this section it first asked whether participants agreed that establishing a robust and credible certification system is an essential first step towards achieving a net contribution of carbon removals in line with the EU's climate neutrality objective (*Q4: Would you agree 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?*), only giving participants the option to respond with yes, no, or no opinion and don't giving space for additional commenting. Beyond this first question the survey tested what participants perceived as the main objectives of such a system, providing a range of options of which the participants could chose three preferred objectives.

Interestingly, the set of answers to this fifth question are heavily focused on various financing or reward mechanisms, linking financial incentives for certain stakeholders or products to specific public or private reward mechanisms. For instance, responses include options such as

- "To provide better financial incentives for land managers (e.g. purchasers of food and biomass products reward climate-friendly agriculture through price premiums or incentive payments – often called 'in-setting')",
- "To provide better public incentives for nature-based and industrial carbon removals in EU and national funding programmes",
- "To provide better financial incentives for carbon-storage products (e.g. bio-based products, woody construction material)",

or

- "To increase the transparency and level playing field of voluntary carbon markets" (Annex 11.2.).

This narrow focus on a few financial mechanisms for certain removal activities stands out, also given that the other proposed objectives are clearly enacting those activities as commodities. As such, the other options include

- "To increase transparency in corporate sustainability reporting and foster the credibility of climate-neutrality claims.",
- "To support the labelling of sustainable products.",

or

- “To allow comparability and competition between different carbon removal solutions.” (Annex 11.2.),

This leads to a key issue: the question seems to be addressing different target groups – from land managers to product developers of industrial removals – asking those stakeholders to essentially choose their type of business model from the list of answers. The flaw here is that the question's design appears to favour private financing mechanisms as the dominant way to achieve the framework's goals. This selection of a narrow set of financing options limits the scope of discussion and may skew the responses towards a market-oriented vision of the framework, regardless of whether all stakeholders actually support such a model or would prioritise other objectives, such as non-financial means, aimed at improving transparency or supporting comparability between solutions outside of a market-oriented vision.

The third section of the survey explored the role of the EU in certifying carbon removals. Participants were asked to clarify what role they believed the EU should play in the certification process (Q6: “Which role should the EU take in the certification of carbon removals?”) and to indicate their preferences on whether private or public entities should perform specific functions within the certification system. The framing of this first question on the EU's role is particularly noteworthy, as it seems to assume that the purchase of carbon removal credits through voluntary carbon markets is the default scenario. Participants were asked to choose between three options:

- “The EU should establish minimum standard requirements on reporting transparency for carbon removals.
- The EU should establish comprehensive standard requirements for carbon removals, e.g. on monitoring, reporting and verification, on the duration of the removal or baseline setting and additionality.
- Voluntary carbon markets work well. There is no need for an additional intervention by the EU.” (Annex 11.2.)

The structure of this question frames the decision as a choice between minimal intervention or comprehensive standards, implicitly positioning the voluntary carbon market as the policy baseline. The question suggests that any EU intervention would be a corrective to the existing voluntary carbon market, evoking a ‘market failure’ approach. I believe, it's again important to note, that this connects different things – a reward mechanism such as the VCM with MRV systems – that do not automatically presuppose the other but their relation is actively constructed by this piece of document work and the way the question is formulated. As such, the

options do not explore other approaches that might be independent of or offer alternatives to the voluntary carbon market structure.

Additionally, under question 7 the section addresses the specific roles that private entities and public institutions should play within the certification process. Participants were asked to express their preferences regarding which type of organisation should be responsible for tasks such as the establishment of certification methodologies, the accreditation of certification bodies, the ex-ante validation of carbon removal projects, and the ex-post verification of removals.

While the set of questions aims to clarify which institutions should take on these responsibilities, it also subtly reinforces the logic of the voluntary carbon market. In the VCM, private entities often act as carbon brokers, operating with commercial incentives that complicate the boundaries between objective oversight and profit-driven motivations. Although public administration is presented as a governance alternative, the distinction between ex-ante validation and ex-post verification mirrors the structure of the current VCM, suggesting a business-as-usual approach rather than considering fundamental shifts in governance.

The focus on the separation of these roles, combined with the emphasis on private sector involvement, reflects a market-driven model that might not fully consider the broader public accountability or non-commercial governance structures that could be more aligned with public interests. By framing the certification system within these familiar structures, the survey limits the space for participants to explore alternative governance models that might go beyond the existing carbon market frameworks.

In the fourth and final section, the survey shifts focus to the methodological details of the certification process. Participants were first asked whether the EU certification framework should differentiate between types of certificates for different types of carbon removals, given the varied nature of these solutions (Q8: "Carbon removal solutions can differ significantly, for example, in terms of the duration of removals or the robustness of monitoring, reporting, and verification. In this context, do you think an EU certification framework should allow different types of certificates for different types of removals?"). Additionally, the survey explored how the EU framework should address the risks of intentional or unintentional reversal of carbon removals (Q9: "Apart from diverging durations of existing carbon removal solutions, storage may also be prematurely interrupted, and carbon may consequently be released back into the atmosphere. What approach could better manage this risk of intentional or unintentional reversal of carbon removals?"). Participants were also asked about the importance of incorporating concepts like baseline and additionality into the certification framework (Q10: "In voluntary carbon markets, the use of baseline and additionality concepts aims to quantify and reward only additional removals, i.e., those that go beyond a pre-identified baseline and would not have occurred in the absence of the incentives. To what extent should the EU certification framework include the concepts of baseline and additionality?"). Finally, the survey

questioned what information should be disclosed as part of the certification process (Q11: "What information should the certification for carbon removal disclose?").

These questions address the technical underpinnings of the certification framework, seeking stakeholder input on how the system should handle the complexities of carbon removal solutions, risk management, liability and transparency. Taken together, these questions indicate that the EU certification framework is being shaped not only as a technical system for monitoring and verifying carbon removals but also as a market device with deep implications for how these removals are incentivised, standardised, and made transparent. The range of options provided suggests that the framework is attempting to balance market flexibility with regulatory oversight, while also addressing the risks and complexities inherent in carbon removal processes. Through this questionnaire, stakeholders are being asked to weigh in on these critical choices, yet the structure of the questions subtly guides responses toward a market-based model that emphasises financial mechanisms, risk management, and commercial accountability.

The questionnaire's focus plays an important role in shaping stakeholder views and guiding the development of the certification framework along a particular trajectory, highlighting the influence of market logic even within a regulatory discussion. As a distinct tool of the overall consultation it serves as a material-semiotic mediator, allowing the interests of diverse actors to be encoded into the language of policy. It allows complex and unsolved scientific and economic concerns to be translated into regulatory standards that can potentially be enforced across the EU. As actors articulate their positions through the consultation, their interests are translated into the specific metrics and rules that will govern the carbon removal market. This process ensures that what is often intangible and complex – such as the permanence of carbon storage or the environmental impact of different removal solutions – is rendered into actionable and certifiable categories.

However, the structure of the questions posed to participants is designed to elicit responses about technical challenges and market-readiness, with little room for discussions around place-based environmental knowledge, local governance of natural resources, or alternative approaches to carbon removal that do not prioritise market mechanisms. This focus carries forward into the presentation of the results. Moving from the structure of the questionnaire itself to the summary report, we see this logic extended in how the responses are categorised and interpreted in the summary report (European Commission, 2022b).

Organising Responses: From Survey to Summary Report

The consultation's structure inherently groups participants into predefined actor categories – academic or research institutions, business associations or trade unions, citizens, EU citizens

and non-EU citizens, as well as non-governmental organisations (NGOs) or environmental organisations. This aggregation of respondents helps organise the vast amount of feedback into manageable categories, making it easier for the Commission to identify and respond to the perspectives presented. By sorting participants into these groups, the EUCOM not only simplifies the interpretation process but also delineates distinct sets of interests, allowing for more targeted engagement with different *stakeholder groups*.

2 OVERVIEW OF RESPONDENTS

A total of 396 valid replies were received. The largest group among all respondents were companies/ business organizations (38%, 150 of 396), followed by business associations (20%, 81 of 396) and EU citizens (18%, 73 of 396).

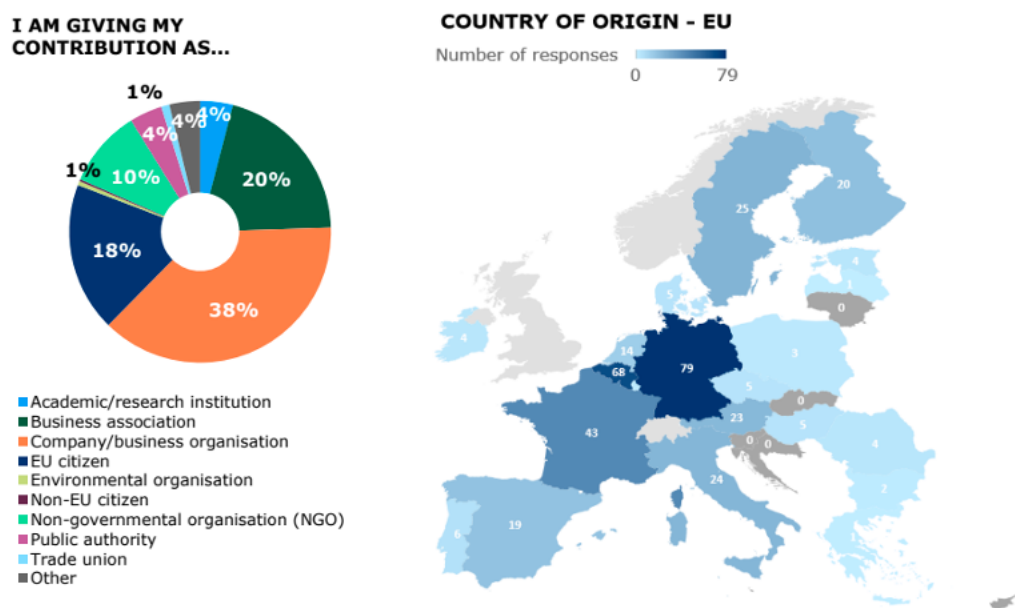


Figure 7 "Overview of Respondents" (European Commission, 2022b, p. 1)

While it is apparent that there are certain stakeholders who are particularly in the focus of regulation, there is also the invocation of a somewhat broader concept of the public, which is also reflected in the visual expression of the Summary Report (cf. Figure 7). Even though the Summary Report document explicitly points out that '[r]esponses to the consultation activities cannot be considered as a representative sample of the views of the EU population' (European Commission, 2022b, p. 1), the document nevertheless conveys a specific impression of a European public that is concerned with the certification of carbon removals.

This aggregation serves an important function in constructing the market. By grouping stakeholders into these large, vague categories, spread across the EU, the consultation treats carbon removals as a somewhat unified field, masking the underlying complexities and uncertainties between different actor-networks. For example, farmers and foresters – who are focused on land-based carbon sequestration and face challenges related to land use,

biodiversity, and long-term sustainability – are brought under the same umbrella as companies involved in industrial carbon removal technologies, which prioritise scalability and market integration. In doing so, the consultation treats these groups as equivalent stakeholders in shaping the carbon removal certification framework, even though they operate within fundamentally different contexts.

Thus, it is noticeable that the stakeholder categories to which the participants assign themselves include other groups that have not previously appeared in any description of the targeted stakeholder groups. These include, for example, academic or research institutions, business associations or trade unions, citizens, EU citizens and non-EU citizens as well as non-governmental organisations (NGOs) or environmental organisations. At this point, the outreach of the EUCOM, which has a certain target audience in mind, is joined by a public that may be different from the one primarily targeted.

While the establishment of actor categories is also common to other EUCOM consultations and also the visualisation tools are no exception for the CRCF consultation, the specific determination of which actors ought to contribute to this specific hearing portrays the network power of the EUCOM and its external services in that they are able to define the boundaries of the network in this particular moment. With the CRCF in general, they are establishing an obligatory passage point for actors to become part of a future carbon removal market.

Nevertheless, or perhaps precisely because of the standardised visualisation tools of the public consultations, these tools can be seen as a way of creating a concept of the public within these standardised consultation procedures. In the context of the CRCF as an umbrella framework involving such a wide range of different stakeholders, this is a further step towards operationalising and standardising the landscape of interests.

For instance, by treating farmers, land managers, and industrial operators as part of the same generalised "business" category, the consultation obscures the significant differences in their stakes, capacities, and concerns. A small-scale farmer practicing carbon farming likely has different priorities from an industrial company exploring engineered carbon removals. Yet, the consultation invites them to engage with the framework on equal terms, through the same lens of market participation and certification.

This aggregation of actors into broad categories, while efficient for managing input, conceals the complexity within these groups, for example, flattening the distinctions between the natural solutions associated with land-use practices and the technological solutions being developed by industrial actors. It presupposes that the concerns of a multinational corporation are comparable to those of small local enterprises or individual land managers. By doing so, the

consultation subtly promotes a view that all these actors are equal players in the market, capable of engaging with carbon removal technologies in a similar way.

By grouping these diverse participants together, the consultation constructs a notion of a differentiated, yet generalised public that can be engaged, rather than acknowledging the nuanced differences that exist between their roles in carbon removal. Thereby potentially privileging some perspectives who are best positioned to thrive in a marketised carbon removal framework – namely, industrial operators and large companies. This not only shapes the kinds of solutions that will be considered viable but also marginalises actors who may advocate for more localised or decentralised approaches to environmental governance.

In practice, however, this might mask the inequities of power and access to resources between them. As layed out in Section 5.2.1., I additionally noticed several errors in the self-classification of the respective participants. For example, several companies declared themselves as NGOs, including a listed oil company. In other instances, organisations, which I would have expected in the NGO actor category, such as ‘La Via Campesina’, contributed under the actor category of a ‘Business Company’.

Without wanting to jump to quick conclusions, these instances show classifications are also never neutral; they are sites of power and negotiation, shaping how groups are organised, recognised, and can interact within a system. They are instances, in which actors are enrolled to a certain script, yet there are also moments, where actors may resist or detach from these roles, highlighting the possibility for fluidity and contestation inherent in such systems. This underscores the importance of scrutinising the ways in which institutional frameworks, like the consultation process, mediate and potentially shape the representation of diverse interests – but, importantly, also how they are possibly contested. This is what we are going to analyse in the next and last section of the findings.

7.2.6. Interim Conclusion

Before exploring how actors might engage with the regulatory process in ways that deviate from the script or break away from it, I will briefly summarise the key findings from this second part of the analysis, which focused on the role of different market devices.

The external consortium was tasked with producing two assessment reports and conducting a public consultation, all of which acted as distinct market devices in preparing the groundwork for the Impact Assessment and the proposal for the CRCF regulation. These two reports functioned as coordination tools, comparing a wide range of carbon removal approaches and existing certification mechanisms, ultimately refining and adapting them into forms suitable for inclusion in the CRCF. By expanding the scope of previously assessed carbon removal methods, the reports managed uncertainties around the practical and regulatory aspects of each

solution, thereby defining the object of the framework – the specific carbon removal methods the regulation would govern.

In addition to expanding the scope, the reports provided a framework for distilling and making various certification mechanisms transportable and comparable. This process was essential for legitimising the criteria that would underpin the new European framework. By categorising and assessing individual approaches, the reports acted as heuristic tools, making fundamentally different carbon removal approaches comparable and aligning them toward a shared regulatory goal.

The public consultation revealed how an institutional logic was translated into a mechanism for enrolling external actors into the process, effectively creating two versions of a public to be engaged with: a heterogeneous group of interest groups with a stake in forging new business models for carbon removal operators, and a broader notion of a public concerned with CDR as complex techno-scientific phenomenon. In essence, the consultation device constructed this public through the use of surveys and other representational tools, forming a collective that did not exist as such before the consultation.

Additionally, the consultation process reflected a broader market logic at play. By categorising and simplifying the diverse interests of stakeholders, the consultation rendered these actors fit for participation in a future market where various carbon removal solutions – such as carbon farming and industrial removals – could be commodified, standardised, and traded under a unified regulatory framework. This standardisation was necessary to create a system where these diverse practices could be measured, certified, and traded based on a common set of rules.

The consultation for the CRCF was a critical mechanism for translating stakeholder interests into the regulatory categories, rules, and procedures that will ultimately govern the carbon removal market. The Call for Evidence and summary report illustrated how the consultation process helped align stakeholder perspectives with the EU's regulatory objectives.

7.3. Performative Struggles Around Market Devices

In the previous chapters, we examined how a distinct domain for a carbon removal market was carved out through the strategic framing of CDR as a marketable object, laying the groundwork for subsequent regulatory action. This analysis included an exploration of the various market devices – document-based tools used to shape and stabilise this emerging market – such as assessment reports and the public consultation process. These devices not only established the technical and regulatory boundaries of what could be recognised as CDR under the new framework but also sought to manage the uncertainties inherent in its implementation. Crucially, the consultation process played a dual role: while it invited external actors to

contribute to the institutional framing of CDR, it simultaneously functioned as a mechanism to shape and "standardise" these actors and publics. By structuring engagement through predefined questions and formats, the process subtly constrained how stakeholders and the public could participate, thus aligning them with the envisioned market logic. In this section, we delve deeper into the consultation process, analysing how it framed participation and influenced the ways in which actors engaged with or contested the institutional narratives around CDR, revealing its role as a tool not just for inclusion but also for standardisation in the market-making process.

We just observed how the European Commission presented the consultation through its official documents. The results of the multiple-choice questions were broken down into considerable detail, in a way that helped create a certain notion of a public concerned with carbon removal. Less visible, however, were the numerous position papers submitted by stakeholders, in which they had the opportunity to express their views in more detail, without having to adhere strictly to the script provided by the EU Commission. These position papers were barely mentioned, apart from a brief reference in the final section of the consultation summary:

“ 3.4 Final remarks

A total of 267 open public call participants used to opportunity to provide final remarks in an open text box and/ or to upload further documents, e.g. position papers. The most central topics discussed in these submissions were 1) the expected objectives of the certification (28%, 75 of 267), 2) the risk of negative impacts on stakeholders (22%, 60 of 267), as well as 3) views on nature-based solutions (18%, 48 of 267) and 4) duration/permanence (18%, 48 of 267).” (European Commission, 2022b, p. 5)

The sheer volume of these position papers collected during my own data gathering suggests that many relevant insights from stakeholders may have gone relatively unnoticed in the Commission's summary. This observation motivates the final part of our analysis, where we shift focus to moments of contestation within the consultation process. Here, we will explore how various actors resisted, reinterpreted, or challenged the framing of CDR as a market object, as well as the consultation's role in solidifying such a framework. Many participants expressed skepticism toward transforming CDR into a tradable commodity. In the following section, we will highlight how these challenges came to light, particularly through critiques of the consultation process itself.

Two things up front: The focus on NGOs as a specific group of actors derives from my discussion in Section 2. and 3., where I engaged with the contingent role NGOs play in relation to carbon markets. The goal here is not to comprehensively catalog the positions these organisations put forward during the consultation. Instead, the objective is to examine how the

carefully constructed image of the CRCF – designed to support carbon removal credits in carbon markets – was subject to efforts to contest and destabilise it.

With that, I would also like to counter the common criticism that participants' feedback may ultimately be disregarded or rendered ineffective anyways. It's crucial to recognise that this consultation process served as a crystallisation point for various actors, providing them with a platform to express their stake in the issue and potentially challenge the institutional narrative by engaging with the socio-material infrastructure that this regulatory process enacts. Through this lens, the consultation becomes more than a passive tool for gathering opinions. It emerges as a space where the issue of carbon removal, previously shaped by institutional actors, could be reframed and addressed in different ways, marking a moment in which an alternative understanding of the issue can emerge.

However, it is important to note that the impact assessment, on the contrary, takes up the critical positions of individual stakeholder groups, including prominently those of NGOs, and uses them to legitimise its framework design, making their criticism productive.

Thus, in the next section, we will delve deeper into the dynamics of contestation. We aim to reveal the interplay between institutional design and actor agency, uncovering how the processes of engagement are as much about contesting as conforming to the established norms of marketisation. This analysis will demonstrate that while the consultation device aimed to legitimise and standardise CDR as a market object, it also opened up avenues for resistance and alternative visions for how CDR should be governed.

7.3.1. From Critique to Compliance: The EU's Appropriation of Market Contestation

To understand how these interventions diverge, we should first look at how they are detailed in the Impact Assessment. Beyond the Summary Report, participants' contributions were also incorporated into the final documents of the Impact Assessment and Proposal. In particular, the second part of the Impact Assessment (European Commission, 2022d) includes a *Synopsis Report* (pp. 5-17), which analyses both the individual survey comments and the position papers that were submitted as attachments to the survey or described by the European Commission. Some of these papers stemmed from the consultation on the Sustainable Carbon Cycles Communication and others were selected by the external consortium. The *Synopsis Report* thus organises the feedback into 'additional comments' and 'position papers,' a distinction made for reporting purposes. However, in my analysis, I will treat these materials symmetrically to maintain a balanced perspective.

First, let's turn to how the 'final remarks' are presented. These are the comments that participating organisations could provide at the end of the survey. Overall, the report found:

“The two topics that were most often addressed are the expected objectives of the certification (75 mentions) and the risk of negative impacts on stakeholders (60 mentions).” (European Commission, 2022d, p. 11)

Specifically for NGOs, the document provides a more detailed summary:

“NGOs (38) and environmental organisations (2) expressed preference for an approach that is comprehensive, transparent and driven by public authorities. A key topic for these stakeholder groups was the priority of GHG emission reductions over removals. Respondents from NGOs and environmental organisations most often selected potential environmental co-benefits as the criteria for determining which specific solutions to incentivise through the certification mechanism. Like EU citizens, the majority of NGO respondents called for including a wide range of both carbon farming and industrial removal solutions in the certification mechanism, but the selection was more cautious than other stakeholder types. Particularly industrial solutions received more replies for later or no inclusion than the overall responses. The majority of NGOs and environmental organisations expressed a preference for public administration to take over all functions in relation to certifying removals. In the views of these stakeholders, defining additionality and preventing reversals were important challenges that need to be tackled as comprehensively as possible. Similarly, the disclosure should enable full transparency on all aspects of the removal. Regarding what information should be disclosed, NGOs and environmental organisations had the highest average number of options selected with 9.7 and 10.5 out of 13 options. Additional remarks from NGO respondents most often related to nature-based solutions and the potential to create effective co-benefits for ecosystem restoration and biodiversity.” (European Commission, 2022d, p. 12)

This representation of feedback from external stakeholder throughout the *Impact Assessment*, performs a specific function. It portrays the diverse comments from different stakeholders as overall supportive of the carbon removal certification framework, with critiques framed as suggestions for improving the system. Even the reservations expressed by NGOs – such as their cautious approach to industrial solutions or their insistence on prioritising emission reductions over removals – are incorporated into the narrative in a way that aligns with the overarching goals of the certification framework.

The document achieves this by emphasising areas of alignment, such as the shared preference for transparency, public authority oversight, and the need for safeguards like additionality and disclosure. Where differences arise, they are portrayed as constructive, aimed at refining or expanding the framework rather than challenging its fundamental premise.

This has the effect of positioning NGOs not as opponents of the market-based approach to carbon removals, but as contributors whose input can fine-tune the process. Thus, rather than depicting NGO concerns as questioning the logic behind the framework, the *Impact Assessment* subsumes their critiques into a broader narrative of improvement, reinforcing the legitimacy of the market-oriented approach.

This pattern also extends to the analysis of position papers featured in the *Synopsis Report*. The report presents the distribution of these position papers graphically, similarly to the summary report from the call for evidence (see Figure 8).

Figure 5: Number of position papers per stakeholder type (N=221)

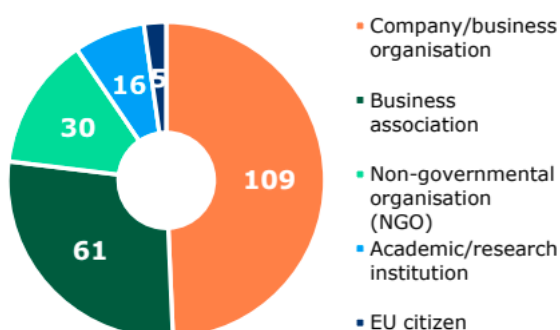


Figure 8 "Number of position papers per stakeholder type (N=221)" (European Commission, 2022d, p. 14)

Although we shouldn't focus too much on this schematic, it is noteworthy that the share of position papers submitted by NGOs appears to be significantly higher than in the overall contributions (compare with Figure 7). Interestingly, the category of "Environmental Organisations" seems to have been either omitted or subsumed under another actor category at this point. The *Synopsis Report* summarises the overall contents of the position papers as follows:

"The expected objectives of the certification were similar across all position papers, with two main themes. First, stakeholders expressed support for carbon certification as a way to provide economic opportunities for sectors such as agriculture, forestry, and land-use sectors. In essence, these stakeholders stressed that a certification for carbon removals should be used as a tool to accompany other measures and investments that reduce emissions. Second, another key objective across stakeholders was the importance of internationally harmonising the frameworks regarding carbon removals. Some other notable objectives included sufficiently and credibly rationalising and incentivising negative emissions for investors, as well as the desire for government

engagement to promote stability within the system.” (European Commission, 2022d, p. 14)

Another graphic categorises the position papers by stakeholder type, highlighting the prioritisation of certain criteria based on the frequency of mentions (see Figure 9).

Figure 6: Topics covered by position papers and per stakeholder type

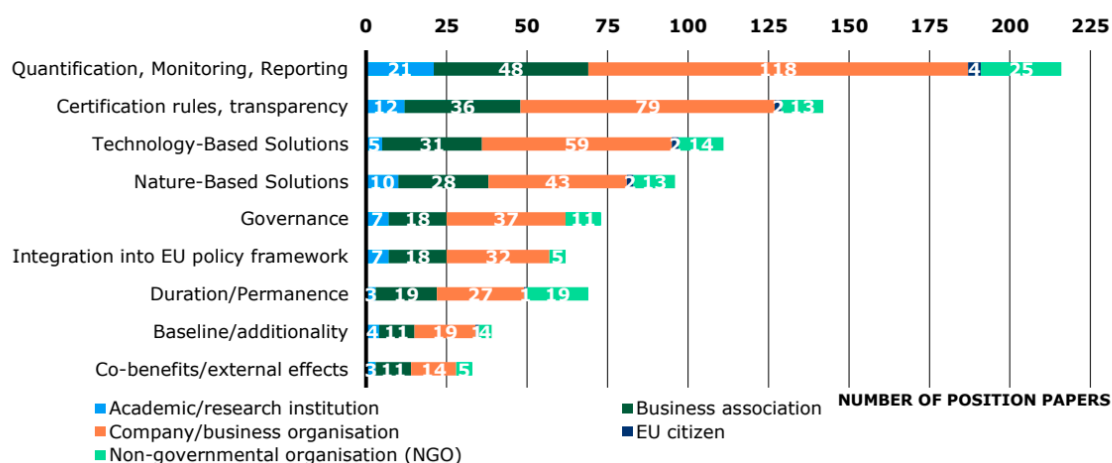


Figure 9 "Topics covered by position papers and per stakeholder type" (European Commission, 2022d, p. 15)

Beyond these overarching insights, the report breaks down the feedback from NGOs in particular:

“44 submissions came from NGOs and environmental organisations. These stakeholders also widely supported the Commission’s initiative. NGOs highlighted the importance of an ambitious mechanism that contains robust provisions for MRV, additionality and permanence. Further topics raised were the importance of emissions reductions to achieve climate targets and the need for holistic assessments of environmental impacts of removal solutions beyond the carbon balance. (European Commission, 2022d, p. 13)

By framing stakeholder feedback as part of a collective effort to improve the certification mechanism, the document presents the marketisation of carbon removals as a consensus-driven process. Even where disagreements or critiques arise, they are framed as debates over how best to achieve the framework's goals, rather than questioning its core principles. This method of representation lends legitimacy to the process, suggesting that all concerns are being addressed in the service of enhancing the regulation’s design and functionality.

However, this portrayal overlooks the fact that several actors, particularly NGOs, are not merely refining the framework but are actively contesting the consultation process itself as a biased market device. The subsequent analysis will shift focus to examine how these actors

challenge the consultation's structure, arguing that it limits genuine critique and forecloses alternative approaches to carbon removal outside of market logic.

7.3.2. Challenging the EU's Public Consultation as a Market Device

Far from being a neutral platform, the consultation itself is being challenged as a market device that constrains critique and privileges a market-oriented approach to carbon removals. This section will explore how different actors contest not only the content of the framework but the very structure of the consultation process. Their criticisms underscore a pattern of coalition-building among NGOs, uniting to amplify their voices against this perceived bias. Notably, the Impact Assessment report mentions:

“The analysis of responses uncovered several small clusters of coordinated responses, but no campaign that would skew the overall results. Therefore, all submissions were analysed and reported, while dividing trends by stakeholder type.” (European Commission, 2022d, p. 6)

Indeed, my own analysis identified similar coordinated responses. A notable example is the submission of an open letter by *La Via Campesina*, co-signed by several organisations, including *Friends of the Earth Europe*, the *Institute for Agriculture and Trade Policy (IATP)*, *Corporate Europe Observatory (CEO)*, *FIAN Belgium*, and *CCFD - Terre Solidaire* (European Coordination Via Campesina, Annex 11.3., Ref. 43) While coalition-building among NGOs is not a novelty, the significance of this letter lies not only in the collective response but also in its direct critique of the consultation process itself. The letter begins with a sharp critique of the structure of the consultation:

“The Consultation on the certification of carbon removals is heavily biased towards a carbon offset and crediting approach. Its multiple choice questions are single-mindedly focused on setting up a removals certification system dependent on voluntary carbon market offsets, foreclosing genuine inquiry and consideration of other approaches for a removals framework. It therefore leaves little space for critics of this flawed approach, which will in turn have devastating consequences not only for the climate, but also for rural areas.” (European Coordination Via Campesina, Annex 11.3., Ref. 43)

While the NGOs articulate their positions clearly in the joint letter, raising concerns about the proposed MRV systems—including threats to farmers' autonomy, high costs and liability risks, and the uncertain reliability of carbon sequestration in land—they also open up a direct critique of the consultation itself. They challenge what they see as its biased and leading nature,

arguing that the structure of the consultation limits genuine engagement with alternative approaches to carbon removal.

This instance of coordinated critique is not an isolated case; it appears that other NGOs also collaborated in drafting their survey responses. Although not all contributions demonstrate this level of alignment, it is important to highlight these coordinated interventions as significant moments of collective contestation. For example, *CCFD - Terre Solidaire*, along with the two branches of *ActionAid Europe* and *ActionAid Netherlands*, echo the same line of critique. Even though *CCFD - Terre Solidaire* was already a signatory of the open letter, there are identical passages in their individual submissions and those of *ActionAid*:

“Q 6&7 presuppose that certification of MRV protocols to generate carbon credits for removals is a given. Such an objective for EU’s climate policy on removals is misguided. The approach formalizes & legitimizes removal credits for offsets. It would allow polluters and governments to delay & obfuscate action towards real emissions reductions urgently needed this decade. The scope of the EC’s initiative on removals should be limited to having a science-based and ambitious criteria for what constitutes permanent removals. These criteria should set a high bar for real removals to abate residual emissions only after all possible GHGs have been reduced in the next 10-15 years.

A public model of governance and accountability is essential for avoiding conflicts of interest embedded in the private sector’s drive to attain “net-zero” climate targets. It must ensure that carbon removal criteria does not lead to legitimizing or increasing corporate greenwashing and inaction. Trading of removal credits on VCM markets diverts capital from the direct financing of mitigation to keep emissions within 1.5C. There is no evidence that carbon offset programs work to reduce GHGs.” (*CCFD - Terre Solidaire*, Annex 11.3., Ref. 30; *ActionAid Europe* and *ActionAid Netherlands*, Annex 11.3., Ref. 35)

I believe, it's telling that these NGOs are not just critiquing the general direction of the carbon removal framework but are specifically calling out the framing of particular questions within the consultation questionnaire. This focus on questions 6 and 7 highlights their concern with the leading nature of the consultation itself – suggesting that the way these questions were structured nudged respondents toward supporting a market-based approach to carbon removal.

Question 6 asked respondents to choose between three options regarding the role they envisage for the EU in the certification of carbon removals: (1) the EU should establish comprehensive standard requirements for carbon removals, focusing on aspects like MRV, as well as the duration of removal and baseline setting; (2) the EU should establish minimum standard requirements on reporting transparency for carbon removals; or (3) that voluntary carbon

markets work well, and there would be no need for an additional intervention by the EU. By structuring the question in this way, the consultation implicitly frames the discussion around a narrow set of options, all of which accept the legitimacy of market mechanisms as the default context for carbon removal activities. Especially, the formulation of the third answer choice – “voluntary carbon markets work well” – implicitly signals a baseline scenario in which the voluntary carbon market continues to operate independently, as if that is the natural state. This framing is telling because it assumes that, in the absence of EU intervention, the market itself would be the primary driver of carbon removal efforts, sidelining the possibility of other policy approaches that might intervene without relying on market mechanisms.

Question 7 further entrenches this bias by asking stakeholders which type of entity – public or private – should carry out the functions in the certification process, including both the establishment of certification methodologies and the verification (either ex-post or ex-ante⁴) of carbon removals. By asking stakeholders to choose between public or private entities for the certification process, the question implicitly aligns with the established practices of these markets, where private firms dominate the verification landscape. This setup not only reinforces the idea that market-based mechanisms should lead the governance of carbon removals but also embeds the role of private verifiers as key actors in legitimising carbon credits.

These verification companies, integral to the carbon industry, often operate with commercial incentives that can blur the lines between objective oversight and profit-driven agendas. By positioning these private entities as the default or natural choice for managing verification, the consultation’s framing hints at a privatised governance model that prioritises the status quo of voluntary carbon markets over alternative models that might emphasise public accountability or community-based oversight.

This strategy of calling out the specific wording and framing of these questions is crucial because it reveals how the consultation process itself can act as a mechanism of boundary-setting, shaping the limits of what is considered valid or possible within the policy conversation. Among other statements this is underscored by *IATP Europe* stating that “the Commission’s approach to removals presupposes that the certification of MRV protocols generating carbon credits finances by carbon markets is a given” (Annex 11.3., Ref. 28), or the Hungarian NGO *Fertő tó Barátai Egyesület*, which holds that [t]he lack of questions in the consultation related to revenue raising options is perplexing” (Annex 11.3., Ref. 8).

⁴ Meaning that the verification of the removal activity is conducted before or after a carbon credit is issued. Ex-ante verification occurs before the activity begins, estimating carbon removal based on project projections, which can lead to uncertainty and overestimation. Ex-post verification happens after the activity.

By highlighting the leading nature of these questions, these NGOs are drawing attention to the power of framing in guiding stakeholders toward predefined answers that align with the market-based objectives of the European Commission's proposal. This kind of critique suggests that the consultation is not a neutral platform for gathering diverse opinions, but rather a market device that structures the feedback in a way that reinforces a particular vision of carbon removal. The *European Environmental Bureau* frames it, as follows:

"This questionnaire is highly biased and poorly designed, with many questions asked in very ambiguous terms and in some cases seemingly not in line with the topic of the consultation (most notably questions asking about "EU Climate policies" as a whole rather than the certification mechanism specifically). Additionally, many questions could not be answered meaningfully given the lack of information on the purpose of the initiative and the intended use of the certified units.

Although the initiative is presented in generic terms, most questions were framed in a way that clearly aimed at the creation of carbon credits to be traded on voluntary carbon markets. Voluntary carbon markets are only one of many possible financing mechanisms for carbon removals and should not be assumed to be a desirable choice without an adequate public debate. The choices made by the EU with regards to which financing mechanisms to promote are not neutral and will have major impacts on the integrity of our climate framework, on other environmental dimensions, and on rural populations, to name but a few." (Annex 11.3., Ref. 10)

This is supported by another striking feature of the responses, in that the already mentioned the *European Coordination Via Campesina*, *CCFD - Terre Solidaire*, *ActionAid Europe* and *ActionAid the Netherlands*, and this time also the NGO *BirdLife Europe and Central Asia*, as well as the French *Confédération Paysanne*, have included an almost identical appeal in their 'final remarks':

"We register our deep dissatisfaction with the EC's public consultation process & lack of willingness for a genuine inquiry. This is a huge, missed opportunity & will lead to biased outcomes and a flawed assessment of responses. Neither are in the public interest given the existential nature of the issues at stake. This questionnaire is poorly designed, with many ambiguous questions. Although the initiative is framed in generic terms, most questions clearly aim to set up certification of MRV protocols for carbon credits; for offsets to be traded on voluntary carbon markets.

The choices the EU makes with regards to these mechanisms are not neutral. They will have major impact on the integrity & ambition of our climate framework; on critical environmental and social dimensions i.e. on climate risk and adaptation, land

consolidation and prices, land grabbing & in turn on rural populations, to name but a few.“ (Annex 11.3., Ref. 42; 30; 35; 21 & 43)

Interestingly, many of these organisations focus on land-related issues, pointing to the socio-material consequences of the consultation's framing. Their critique, therefore, goes beyond questioning the biased nature of the consultation, calling attention to the broader impacts of how issues are enacted in this process, particularly on rural communities, land use, and environmental justice. This suggests, as we discussed in the theoretical chapter on politics as a socio-material practice (see Section 3.2.1.), that the *frame* of the consultation not only shapes the discourse but also reinforces specific socio-material arrangements that would have profound real-world effects.

7.3.3. Land-Based Removal Practices: Socio-Material Impacts of Carbon Markets

In this sub-section, we thus turn our attention to the socio-material entanglements that shape how different NGOs, particularly those representing the interests and stakes of land-related practices like carbon farming, articulate their concerns in response to the consultation. That makes clear that we are not talking about an anti-market framework or an "attitude" towards carbon markets.

By examining these attachments, we can better understand how these actors position themselves within the controversy as participants whose lifeworlds are directly implicated in the material practices of carbon farming and land stewardship. This perspective shifts the focus from the procedural dimensions of the consultation to the pragmatic entanglements that anchor these NGOs to the very issues they seek to intervene.

In particular, it shows how the organisations are drawing on the experience of existing market-based mechanisms that they and other practitioners have gained in the process of carbon financialisation. As such, the Open Letter signed by the group of organisations cited in the previous section notes:

“While the Commission call [sic] it a “new opportunity”, we see that farmers are bearing all the risks while companies are only benefitting. The Commission can no longer afford to ignore the poverty and despair that takes place in the farm sector. France reports a farmer suicide every two days. The risk of liability for farmers for impermanent land-based sequestration cannot be understated. What farmers who are implementing farming practices that are good for society and the environment need is rather stable and predictable income.” (European Coordination Via Campesina, Annex 11.3., Ref. 44, p. 3)

This critique of the missing stability in these reward mechanisms is key to a lot of responses and thus aligns with *IATP's* concern about the financial risks associated with carbon farming, stressing that:

"Carbon markets are extremely volatile. Farmers require stable and predictable finance to make ongoing changes to their farms to make lasting shifts to green practices on their lands. The lack of stability could result in farmers abandoning good practices because of the high financial risk involved in carbon farming schemes." (Institute for Agriculture and Trade Policy, Annex 11.3., Ref. 29)

These responses illustrate the socio-material entanglements that complicate the participation of small-scale farmers in carbon markets. The volatility and unpredictability of carbon credit prices not only threaten the financial viability of sustainable agricultural practices but also risk disincentivising those farmers who have already committed to enhanced ecological practices. These concerns are echoed by *IFOAM Organics Europe*, which underscore the risk that if carbon prices are too low, farmers might not benefit from their additional efforts to enhance soil carbon sequestration:

"A risk of a carbon market with tradeable carbon credits is, that the price of the credit will decide whether increasing soil carbon sequestration is a financially rewarding option for a farmer. If the price is too low farmers risk not profiting from their additional efforts and a low carbon price might even disincentivise favourable management practices." (IFOAM Organics Europe, Annex 11.3., Ref. 4, p. 7)

This volatility is further amplified by the structural biases within carbon markets that favor large corporations capable of influencing carbon credit prices. *IFOAM Organics Europe* states that:

"The price for carbon credits on a voluntary carbon market will not be determined by the actual cost of carbon sequestration but by the buyers of carbon credits to off-set their carbon emissions. This might favor big companies that are being able to pay a higher price for carbon credits and potentially pose a barrier for small operators or new start-ups to access the market because of their inability to buy carbon credits to offset their emissions." (IFOAM Organics Europe, Annex 11.3., Ref. 4, p. 7)

The concerns articulated by these NGOs also reveal their experiential knowledge of how carbon markets have historically incentivised industrial agricultural practices over alternative approaches. For example, the *IATP* position paper points out:

"A carbon market approach incentivises industrial agriculture and increases cost of land and land use speculation. Instead of a just transition to agroecology, the Commission could inadvertently incentivise an industrial and extractive agricultural system with

a CRC framework centred on carbon markets. Carbon project aggregators and major corporate actors with the need to offset a large quantity of emissions look for large bundles of carbon offsets." (Institute for Agriculture and Trade Policy, Annex 11.3., Ref. 29)

This critique suggests that the focus on carbon aggregation and commodification risks further marginalising those who lack the capital and infrastructure to participate on equal footing. By emphasising the practical realities of land speculation and agribusiness pressures, the NGOs expose the material inequalities embedded in carbon farming initiatives that are driven by a financialised logic.

Interestingly, these NGOs do not just critique the proposed certification framework in isolation; they frequently refer to existing certification mechanisms to underscore the structural imbalances inherent in carbon markets:

"Offset programs are ripe for fraud (see US and Australia forestry offset credits) & vulnerable to reversal (see US forestry offsets burned in wildfires). Existing, even so-called 'model', agricultural MRV protocols are far from robust and most are problematic. They are costly with uncertain results, delivering little to ag [agricultural] producers, but offloading financial risk onto them." (CCFD – Terre Solidaire, Annex 11.3., Ref. 31; Bird-Life Europe and Central Asia, Annex 11.3., Ref. 21)

This observation underscores the historical patterns of dispossession that carbon markets can trigger, aligning with concerns about the vulnerability of local communities to external financial pressures. It highlights how market-based solutions not only fail to address systemic inequalities but can actively exacerbate them. Other certification mechanisms become a point of reference. But other than in the case we analysed on synthesising different mechanism designs in the assessment report (see Section 7.2.4.), here we see a more experiential knowledge applied:

"REDD+, the global carbon crediting system for forests, is a disastrous example of how carbon crediting and carbon markets applied to land have provoked land grabbing through expropriation and violation of the rights of indigenous people and peasants without slowing deforestation in the least. In Europe, a carbon market on agricultural land would undoubtedly also lead to even more land grabbing as financial and corporate interests will be keen to profit from the opportunity." (European Coordination Via Campesina, Annex 11.3., Ref. 44, p. 3-4)

This use of past examples to illustrate the dangers of carbon market mechanisms points to a broader concern about how these approaches could replicate similar issues in the context of carbon removals, with large-scale land acquisitions and increased corporate control:

“Farmers’ autonomy over their practices is directly threatened by the fact that the planned mechanisms are managed remotely, by stakeholders who do not know the territory involved and its rich socio-cultural and economic context. MRV mechanisms are complex and require a high level of technical expertise. (...) MRV processes place a heavy burden on farmers with uncertain returns. The collection of opinions from experts and consultants and data requirements imposed at each stage of the protocols make farmers liable for failure and even more vulnerable to external pressure and control. The Commission must come to terms with the direct relationship between farmer poverty and despair and the increasing level of control and intrusion in their livelihoods. MRV protocols will require the smallest actions of farmers to be monitored and recorded, including their work rhythms and production choices, providing large quantities of farmer-owned data to corporations that in many instances have a vested interest in selling other products to farmers. We consider that this control of data gives all too much liberty to those who own it to intrude on the land. New technologies that further remove decision making autonomy from farmers are not welcome. (European Coordination Via Campesina, Annex 11.3., Ref. 44, p. 2)

These comments highlight the fragility of the proposed MRV systems, emphasising how the financial and technical burdens of maintaining these protocols fall disproportionately on small farmers rather than on large corporations or aggregators. The critique goes beyond technicalities to underscore a deeper concern: that these systems are designed and controlled by distant stakeholders, further eroding local farmers' ability to make decisions about their own practices and increasing their vulnerability to market-driven forces that prioritise profit over sustainable livelihoods.

The responses from these NGOs reveal that their critiques are fundamentally tied to the socio-material dimensions of the controversy surrounding the establishment of this framework. Their objections, ranging from the privatisation of data through MRV processes to the liability risks for smallholders and the volatility of carbon credits as a source of revenue, highlight how their lifeworlds are directly implicated in these debates. By focusing on the material and economic realities of carbon markets, the NGOs articulate a resistance not just to the commodification of land-based practices but to the broader transformation of their everyday lives into a matter of financial speculation. This perspective allows us to see how their lifeworlds are entangled in and potentially transformed by the socio-material structures that this framework seeks to implement.

7.3.4. Interim Conclusion

In this section, my analysis has unpacked the European Commission's consultation on the CRCF as a layered arena of documents – ranging from the consultation questionnaire and summary report to impact assessments and NGO position papers – intersect to reveal underlying tensions and performative struggles. The findings reveal a fundamental tension in this consultation process: on one hand, the European Commission presents it as a structured, inclusive, and productive effort to gather a broad spectrum of stakeholder input. On the other hand, there is evident contestation over the CRCF's marketisation of Carbon Dioxide Removal, with NGOs, contesting the consultation's design to reflect a biased, market-driven agenda.

As such, the consultation process itself becomes a point of contestation, challenging not just the content of the framework but the way in which the consultation pre-structures the discourse. The critique highlights the process's narrow focus on a carbon offset approach, effectively excluding alternative approaches and appropriating critical engagement and making it productive for legitimising the framework.

The chapter title, "Performative Struggles over Market Devices," aims to capture the dual nature of this consultation process as both a regulatory step and a site of the contested politics of carbon marketisation in the context of the CRCF. This title underscores that stakeholder responses in these documents are more than passive commentary; they are active contributions to the socio-material practice of marketisation itself, despite their agonistic stance. By analysing these responses, the consultation is shown not merely as a procedural step but as another performative enactment that shapes future regulatory processes and public perceptions of CDR.

This analysis reveals the broader political implications of the CRCF consultation, illustrating how documents, responses, and position papers contribute to market-making processes and indicating that regulatory decisions do not emerge solely from formal statements but from a socio-material interplay of contestation and negotiation. This approach also highlights the potential of social science research to illuminate public and political struggles around market-driven environmental policies, suggesting that these performative engagements may be integral to understanding and shaping the future of CDR policy.

8. Discussion

In my empirical analysis, I have structured the findings into three main sections. First, I examined the regulatory process of carving out a domain for a carbon removal market. Second, I analysed how assessment reports and consultations operate as market devices within this market-in-the-making. Thirdly, I looked more closely at the consultation process that informed the impact assessment of the Regulation, focusing on how it is implemented through a dynamic interplay between the European Commission and external stakeholders, with particular attention to the role of NGOs. Together, these sections address my overarching research question: *How does the European regulatory process of the CRCF transform carbon dioxide removal into a market object?*

This discussion section synthesises the findings from the empirical analysis by focusing on two overarching questions: (1) How do policy documents shape the construction of market devices, particularly through framing carbon removal as a market issue and using assessment reports and public consultations as stabilising tools? As well as, how the consultation process simultaneously enables and constrains public engagement, explored by the ways Non-Governmental Organisations engage with and contest carbon dioxide removal as a market-in-the-making?

These two questions reflect the study's three sub-questions by integrating insights on the framing and stabilisation of carbon removal as a market object (SQ1 and SQ2) with an examination of NGO practices and constraints in this emerging market context (SQ3). This approach enables a critical dialogue between the empirical findings and broader academic debates on the marketisation of climate governance and the socio-material dynamics of public engagement.

As we will see, the two overarching dimensions – the role of documents in market device construction and the consultation's role in shaping public engagement – are closely interwoven, each reinforcing the other within the regulatory process.

8.1. Constructing Market Devices Through Documents

In this analysis, we engaged with various types of policy documents. As we have seen, much of the preparatory work for new policy directions and regulations is, in fact, rooted in document work. Using Asdal and Reinertsen's practice-oriented approach, we examined how their distinct logics of filing serve as *tools of governance*, addressing how carbon dioxide removal (CDR) as an issue is enacted as a public concern.

A key component of this 'modifying work' was evident in the policy documents, such as the *Circular Economy Action Plan*, the *Farm to Fork Strategy*, and the *Sustainable Carbon Cycles*

Communication, which we reviewed in Section 7.1. As strategy documents these documents do not impose strict regulations but rather shape the issue to align with dominant narratives and actors within the network. They help to bring diverse entities into alignment with an overarching aim, such as the creation of a carbon removal market.

They achieve this by drawing together diverse actors, policies, and frameworks into a cohesive domain, essentially carving out a space for a potential market. They assemble imaginative concepts, such as the circular economy, and intertwine them with existing laws, regulations, policy fields, research programs, and other socio-technical devices. Through this process, these documents stabilise and purposefully reframe these elements, situating them within a new market domain.

What was interesting to observe was how this market-in-the-making is not only dependent on the forging of new infrastructures as within the Carbon Removals and Carbon Farming Certification Framework (CRCF), but to a considerable extent also to existing socio-technical infrastructures across different European policy domains. This dual process of creating new and recalibrating existing market devices also brought to light a complex interplay between public and private reward mechanisms. In the strategy documents, public initiatives – such as government funding and incentives – are positioned as initial market drivers, while private, market-based mechanisms are intended to sustain carbon removal efforts over the long term. Existing frameworks such as the EU Emissions Trading System (EU ETS) and complementary instruments such as the Innovation Fund and various EU digital services contribute indirectly to the forging of carbon removal business models. These frameworks act as supporting mechanisms in several ways: the ETS provides price signals that guide investment, while the revenues generated are reinvested in emerging removal technologies through the Innovation Fund. Additional research programmes, such as Horizon Europe, reinforce these efforts by encouraging business activity in carbon farming and carbon removal technologies.

Additionally, as highlighted in Section 7.1.3. on the SCC, these strategy documents also draw upon and connect existing European knowledge infrastructures to the forging of a new market domain, including remote sensing tools, nutrient balance applications, and knowledge exchange platforms. By doing so, they not only promote the scientific and technological basis for these solutions but also integrate them into a larger socio-technical network. This integration fosters a cohesive narrative and organisational structure that presents the impression of a fertile environment in which carbon removal and carbon farming can operate as viable market practices.

Through this arrangement, the documents construct a socio-material assemblage that positions these emerging fields as essential, viable, and interconnected with the EU's broader

policy and economic goals. Notably, the concept of the circular economy – particularly the notion of "circular carbon" (Palm et al., 2024) – that is omnipresent in these strategy documents as a rhetorical figure emerges as a powerful tool in transforming carbon farming and removal into market solutions.

The Commission's strategic documents thus act as mediators, aligning actors across domains and reorienting existing programs within the scope of the EU toward a new purpose: the marketisation of carbon removal. The concept of market performativity, as outlined in the sensitising concepts (Section 3.1.), provides valuable insight into how these frameworks and statements do more than simply describe a market – they play an active role in its creation. Through their performative function, these documents help to construct an environment where carbon removal and carbon farming are not just seen as viable but also as desirable market activities. They facilitate the creation of multiple win-win scenarios between various stakeholder groups, their business practices, the strategic objectives of the European Union as a leader in green business development across sectors – from agriculture to industry – and, ultimately, the global climate. By integrating these frameworks and actors, these documents effectively "set the stage" for carbon removal to be positioned as a marketable asset.

However, in assembling these various issues and actors across different networks, the documents also have to cope with a multifaceted and still-unstable concept of carbon removal, which brings about ambiguities and challenges yet to be resolved. We observe how each document, as a direct or indirect follow-up to others, prompts new document work, functioning as tools that shape actions across various contexts to address these emerging issues.

What followed the strategic documents were thus several complementary assessments. Part of the bureaucratic apparatus we examined included the commissioning of a consortium of consultants to assess a prioritised list of existing carbon removal solutions and certification mechanisms for inclusion in the CRCF, and to support stakeholder consultation (see Section 7.2.). Rather than being mere formalities of the bureaucratic procedure, these documents can be understood as *tools of knowledge* (Asdal & Reinertsen, 2022) that aim to reduce the ambiguity and uncertainty by making things visible and comparable.

The two assessment reports examined in Sections 7.2.3. and 7.2.4. both play a coordinating role by comparing different carbon removal approaches and certification mechanisms, ultimately refining and adapting them for inclusion in the CRCF framework. As what was analysed, the first report expands the scope of solutions by introducing a 'prioritised' list of carbon removal methods, significantly broadening the range of options considered under the European framework. Prior to this regulatory process, the European Union's strategy document "A Clean Planet For All" only considered Bioenergy with Carbon Capture and Storage (BECCS), Direct

Air Capture and Storage (DACCS), and Carbon Capture and Storage (CCS) for fossil CO₂ emissions. The review's assessment of a broader yet prioritised list of removal solutions, based on their 'potential' and 'suitability', marks a significant departure from earlier official assessments and projections of the European Commission, as it seeks to establish a more comprehensive assessment of carbon removal solutions.

This process partly mirrors what MacKenzie (2009) describes in his analysis of carbon markets, where a process of "making gases the same" enables emissions to be exchanged across different territories, types of industrial activity, and underlying material practices. In the case of the CRCF, the goal isn't to standardise gases but rather to make diverse carbon-related activities – from carbon farming to industrial removals and carbon capture and utilisation comparable. To establish a cohesive framework, these solutions, each rooted in distinct domains, regions, and practices, must thus be rendered equivalent for inclusion. What remains stable is their distinction into categories of so-called 'nature-based-' to 'technology-based solutions'.

The key tool developed to facilitate this process is the fiche, as discussed in Section 7.2.3. The fiche functions as an inscription device (Latour, 1987), distilling and organising information about various carbon removal solutions and certification mechanisms to ensure coherence and comparability. By translating complex data into a stable, transportable, and comparable format, the fiche enables the transmission of knowledge across diverse contexts. In this capacity, the fiche acts as a mediator, simplifying and framing information in ways that shape how different removal practices or certification mechanisms are understood, evaluated, and potentially integrated into the CRCF framework. Far from being a neutral or passive representation, it actively "transports" and aligns diverse practices, making them actionable and comparable within the regulatory framework.

The report manages uncertainties around the practical and regulatory aspects of each carbon removal solution by employing flexible classifications and strategic inclusions. By grouping various solutions under the broad category of carbon removal – even while acknowledging that some primarily serve emission reduction rather than removal – it accommodates substantial differences in their applications and underlying mechanisms. This strategic ignorance (McGoey, 2012) not only shapes the framework's development 'in vitro' but also potentially influences real-world funding priorities 'in vivo' (Callon, 2009), presenting technologies that may not fully meet removal goals as essential to the overarching carbon removal strategy.

Another notable aspect of managing uncertainty is how the report handles the projection of expected costs for each solution. Rather than treating uncertainty as an obstacle, the report makes it productive by relying on projected costs rather than current figures. This approach allows future scenarios and expectations to be integrated into the analysis. By presenting these

projections as actionable data, the report transforms uncertainty into something calculable, aligning it with the broader narrative of certainty that it seeks to uphold.

However, beyond the evaluation of the individual solutions, and perhaps even more crucial for our analysis, is that the initial assessment introduces a "portfolio approach" (Bright & Schäfer, 2024) to the governance of CDR, drawing on a financialised logic where various removal solutions with different risk profiles are aggregated. It is not the individual solutions that are of primary importance in the impact assessment and proposal; rather, the concrete methodologies are to be developed in subsequent delegated acts. Instead, the specific governance approach is derived from the assessment reports. The portfolio approach, which acknowledges the existence of a multitude of removal solutions, is positioned as aligning with market dynamics, which are perceived as flexible test beds for developing an optimal combination of solutions. The rationale suggests that this diversity and adaptability are less achievable through centralised or purely public interventions. This highlights the market's perceived role in facilitating technological innovation and risk management in carbon removal.

The second assessment report addresses the fragmented landscape of carbon removal certification by establishing criteria to legitimise the new European framework. By again systematically comparing existing methodologies and infrastructures through standardised fiches, the report highlights the complexity of the field and the pressing need for a coherent regulatory approach. This aligns with its overarching ambition to facilitate harmonisation across diverse mechanisms.

Rather than prioritising a single standard, the report advocates for an integrative, "harmonised" framework to unify diverse removal solutions under one European approach. Drawing on Barry's concept of harmonisation as an "art of European government" (2003), this effort reflects the EU's aim to reduce regulatory variability, fostering coherence and comparability. However, harmonisation transcends mere technical alignment. As Laurent (2022) argues, it involves endowing objects with "qualities" that render them distinctly European market entities. These attributes enable certification frameworks to circulate within European markets, extending the EU's regulatory reach into areas like environmental governance and financial stability. Thus, harmonisation emerges as a dual mechanism: a tool for market governance and a means of amplifying European policy influence.

This performative aspect of the assessment reports is further evidenced by their role in shaping the objects they regulate. As Bowker & Star (2000) explain, the creation of a regulatory framework necessitates disentangling objects from their contexts, grouping them based on shared principles, and subjecting them to manipulations and transformations. Through this process, the reports construct a calculative space where certification mechanisms are

reassembled, making them legible and actionable for market regulation. The QU.A.L.ITY criteria of the CRCF exemplify this reassembling, positioning carbon removals as market-compatible solutions and lending legitimacy to the regulatory processes they underpin.

Moreover, the reports contribute to a systematic framework that not only catalogues solutions but actively shapes the landscape of carbon removal. By selecting 12 certification mechanisms to mirror the initial evaluation of 12 removal solutions, they reinforce a narrative of balance and comprehensiveness. This intentional design bolsters the legitimacy of the CRCF framework, presenting it as a balanced and integrative solution to the fragmented field.

Finally, through this structured and performative “harmonisation” the assessment reports enact a political and epistemological redefinition of the problem and its objects. In line with Waller et al. (2023), who argue that constructing politically independent assessments intertwines governance with broader epistemological concerns, these reports shape how carbon removal becomes a subject of regulatory and scientific scrutiny. Although the assessment reports may not explicitly claim a scientific mandate, their influence on regulation design underscores their broader social and epistemological consequences.

8.2. Shaping and Constraining Public Engagement Through Documents

In the introduction, I referred to Marres’ (2005) insight – “*no issue, no public*” – to suggest examining how, during the process of policy formulation, CDR is ultimately enacted as a public concern. In the case of the CRCF consultation as in other European regulatory projects, this occurs within the context of the better regulation agenda and the dogma of evidence-based policymaking, which aims to ensure that the framework reflects both the general public interest across the EU and the input of a specific target audience, thereby producing more effective and accountable regulations.

While this approach may seem straightforward as a political formula, it is crucial to emphasise that the ways in which different forms of knowledge are weighted or filtered in such processes are far from transparent. The final policy documents may give the impression of clarity and coherence, but this masks the complexity of the underlying dynamics. This represents a particular vision of governance – one that frames public participation as a tool for enhancing regulation through systematised feedback mechanisms.

This conceptualisation assumes an inherent link between participation, transparency, and improved outcomes. However, the actual mechanisms through which such input is translated into policy remain largely obscured. To describe how these documents create spaces where publics can emerge, I draw, as in the previous section, on the concept of *translation*. Following Latour, I understand translation as a process through which complex phenomena are rendered

tangible using specific tools. This is not merely a matter of transferring information but involves its transformation and adaptation along the way.

A key effect of this process is the stabilisation of something that did not previously exist in its final form – a phenomenon that, as I argue, can only emerge under specific conditions. Through translation, unstable phenomena are stabilised and presented as “finished objects”, a phenomenon often described as *blackboxing*. Translation occurs in stages or chains, with each step introducing a new interpretation or modification of the original input.

When examining the chain of translations that, in this case, lead to the stabilisation of an idea of one or more publics, a series of documents were identified within this chain. These include the overview sheet for the Call for Evidence invitation (European Commission, 2022a), the questionnaire (Annex 11.2.), the Summary Report (European Commission, 2022b), and the integration of the results into the Impact Assessment (European Commission, 2022c; -2022d). At least, these are the documents we examined or had access to. It would undoubtedly have been interesting to review internal working reports within the DG CLIMA working group or the supporting consortium. Nonetheless, even the accessible documents provide valuable insights.

From the analysis of the overview sheet for the Call for Evidence (European Commission, 2022a), it becomes apparent that the mission or problem framing embedded within it constitutes a critical, albeit not immediately obvious, step in constructing *a public*. This involves establishing a *policy baseline scenario* under which the consultation takes place and shapes participants' understanding of the framework under development. As we've discussed, this baseline scenario entails the assumption that without the intervention of the CRCF, actors in the voluntary carbon markets would continue to set their own standards. The consultation on the EU certification framework was thus tasked with determining whether minimal standards or comprehensive rules on the certification of each type of removal should be introduced. It also addressed key decisions, such as whether validation and verification should be carried out by private operators or public authorities.

Setting aside the various governance options for the moment, it is important to note that the first step in our chain of translations establishes a specific issue framing. While this baseline scenario is not surprising – given our analysis of how this regulatory proposal was assembled across the different strategy documents into the realm of European climate policy as a ‘market failure’ – it is by no means the only way to initiate a consultation on this subject. It overlooks alternative approaches to governing CDR.

As noted in the State of the Art, the significance of issue framing in participatory formats has been highlighted in similar ways in other studies (Jasanoff, 2007; Callon et al., 2011). While

the consultation opens up a space for diverse actors to voice their perspectives, it simultaneously constrains expression by prescribing a specific *script* (Akrich, 1992). That is, it influences what kinds of perspectives or knowledge are considered relevant, effectively steering participants to engage within a narrow problem space – such as the technical and market-based governance of carbon removal – while excluding alternative framings that might challenge these assumptions.

This *script*, as our analysis shows, extends to the design of the questionnaire. The questionnaire, as another link in the chain of translations, integrates this baseline scenario. Moreover, we observed that despite the stated aim of capturing a broad notion of a *general public*, the questions primarily focus on the interests of specific economic groups as differentiated stakeholders. By soliciting responses to questions addressing the particular business models of either land managers or developers of industrial removal activities, the survey gathers the perspectives of various actors as representatives of business models targeted by the framework.

Once again, my intention is not to argue that this step is particularly surprising given the framework's internal logic. What is noteworthy, however, is how the structure of the questionnaire provides the European Commission with opportunities to present these results in specific ways. This is achieved primarily by employing various representative techniques of social surveys, such as charts, maps, and diagrams. This aspect is important because in the context of policy evidence needs to be demonstrated in ways that can be assumed as almost obvious or at least incontestable. In the word of Law (2009), it needs to be 'costly' to undo these steps of translation. Visualisations and visual tools thus play an important role, as they allow policy makers and others scrutinising their proposals to 'see' this evidence in an authoritative way (Jasanoff, 1998).

The translation of the participants' inputs to the questionnaire via the visual tools we analysed in Section 7.2.5., enables the summary report to support both the representation of distinct actor categories as stakeholder groups and their aggregated preferences as well as a broader notion of a *general public*. This public is shown to comprise not only actors with relations to carbon farming practices or removal developers but also scientific institutions, public authorities, environmental organisations, and NGOs. These are significant actor groups for the stated aim of addressing a *general public*, as they appear to have a stake in the process.

Additionally, the visualisation of regionally differentiated feedback submissions in the representation on a stylised European map reflects the European identity of the framework, demonstrating how actors from various member states engaged with the consultation and positioned themselves on the issue. While the consultation does not claim to comprehensively

represent European civil society, it nonetheless succeeds in temporarily constructing a notion of a European public in this summary report to the Call for Evidence and the later Impact Assessment. This public is framed as recognising the certification of CDR and carbon farming practices as a collective concern.

This shows that the consultation process is not only a space for participation, but also an instrument to construct and stabilise a certain notion of the public sphere – a technology of elicitation (Lezaun & Soneryd, 2007). The representation thereby necessarily remains fragmented and selective, as such a unified public does not exist beyond the context of the consultation and also is contingently constructed within. While participant inputs are used in some instances to support the image of a *general public*, in other instances, the focus shifts towards presenting differentiated positions.

This differentiation is primarily evident in the Impact Assessment document. Here, the positions of the different actor categories are aggregated and contextualised within the framework's broader aspects. Notably, we observed that for NGOs, a distinct notion of a public emerges, emphasising their cautious stance towards central elements of the framework. Overall, the Impact Assessment successfully portrays these positions as a productive element in the regulatory development process, underscoring the importance of safeguards in the regulation. What remains sidelined in this process, however, are the numerous instances where the consultation, as a market device, was directly contested or critiqued.

As we observed, the consultation also created alternative moments and opportunities for collective action. This was particularly evident in the joint statements produced by various NGOs. Beyond their technical critiques of the framework, these organisations' collective responses offer valuable insight into how they engage with the governance apparatus – marking it explicitly as a market device.

A key concern was thus the framing of the consultation questions, which structured stakeholder feedback around narrow options favouring market-based approaches. By asking whether the EU should establish comprehensive standards, set minimum transparency requirements, or defer to voluntary markets, Question 6, for example, assumed the legitimacy of market mechanisms as the default context. Similarly, Question 7 reinforced the dominance of private actors in certification, sidelining the potential for non-market approaches.

This framing prompted NGOs to critique the consultation as more than a flawed design; they framed it as an instrument reinforcing market-based governance. These critiques highlight how the process not only constrained the policy conversation but also shaped the limits of contestation, marginalising alternative visions of carbon removal. The consultation thus

emerges as a market device, embedding carbon removal governance within a market-compatible framework under the guise of stakeholder engagement.

However, contrary to earlier framings of such critiques as an ‘anti-market’ *attitude* (MacKenzie, 2009), the positions articulated by these NGOs reflect their deep socio-material entanglements with the infrastructures and practices of carbon markets. These critiques emerge not as a wholesale rejection of market-based mechanisms but as a reflection of how such frameworks intersect with the lifeworlds and economic realities of land-based practitioners.

The responses, particularly from organisations representing farmers and land stewards, highlight the structural vulnerabilities introduced by volatile carbon pricing, liability risks for impermanent sequestration, and the financial burden of compliance with certification protocols. These concerns underscore how existing inequities in agricultural and land-use systems are exacerbated when market-driven mechanisms are layered onto them. The critiques further draw attention to past experiences with offset mechanisms like REDD+ and other certification frameworks, which have been implicated in land speculation and dispossession, reinforcing the unequal power dynamics that these markets often amplify.

Interestingly, these articulations predominantly come from organisations deeply rooted in land-based practices, whose constituents bear the immediate socio-economic risks of these schemes. This focus on land-based carbon removal raises broader questions about how similar, though distinct, impacts might emerge in other carbon removal contexts, such as industrial application and infrastructures. These initiatives, while ostensibly less tied to rural livelihoods, are likely to introduce their own socio-material challenges, influencing the workers, communities, and regions tied to the infrastructures supporting industrial carbon removal. The uneven distribution of risks and benefits across different sectors and geographies thus remains a critical concern that the framework must address.

By framing their concerns through the lens of socio-material entanglements, these organisations move the debate beyond procedural critiques of the certification framework. They foreground the lived experiences and pragmatic realities of those most directly affected, challenging the financialised logic that prioritises market efficiency over ecological justice and sustainable livelihoods.

The analysis of this case leads to the sobering realisation that despite the potential for a broader discussion on alternative financing and reward mechanisms for CDR activities – and potentially also for carbon farming, though this is not the focus of this study – these discussions were not taken up. Instead, based on a singular *policy baseline scenario* that assumes the voluntary carbon market operates unchanged and removals are accommodated, the

certification framework's guardrails were designed. Simultaneously, the emergence of publics was steered and restricted through a series of translations.

This reinforces observations from other studies (Waller et al., 2023b) that the integration of CDR into climate policy proceeds as a technocratic governance process with a predominance of cross-cutting techno-economic expertise that organises interests in a top-down manner. In terms of the "efficacy dilemmas" associated with technocratic activism as reviewed in the State of the Art (Section 2.4.), this case demonstrates how antagonistic document practices mutually reinforce the continuation of a carbon market logic. Moreover, critiques of the governance process were productively incorporated into the legislative institution's safeguarding principles. Rather than fundamentally altering the governance structure, these interventions are "black-boxed," meaning that the transformative potential of public input is diminished, and the focus shifts to how the market can be safeguarded and reinforced. The consultation process thus crafts a public that aligns with the interests of the framework's objectives.

9. Conclusion

In this thesis, I have examined how the European regulatory framework – the Carbon Removals and Carbon Farming Certification Framework (CRCF) – transforms carbon dioxide removal (CDR) into a market object. Through a detailed analysis of policy documents, assessment reports, and consultation processes, I have uncovered the mechanisms that underpin this transformation and their broader implications for debates on standardisation and marketisation of CDR.

My research demonstrates that establishing a carbon removal market in the EU is a multifaceted process in which market-based logic is embedded throughout the framework. While the CRCF does not exclude the possibility of crediting mechanisms, my findings reveal that this is only one dimension of its alignment with market-driven approaches, which are evident across the broader design and implementation of the framework. It involves strategically framing CDR and carbon farming as win-win business models within the EU's advancement towards a circular economy. Policy documents like the Circular Economy Action Plan, the Farm to Fork Strategy, and the Sustainable Carbon Cycles Communication have played crucial roles in aligning diverse actors across multiple policy fields and integrating CDR into the EU's economic and environmental objectives.

Critically, the creation of this market domain is deeply intertwined with existing carbon market infrastructures, such as the EU Emissions Trading System (EU ETS) and the Innovation Fund. In light of discussions about eventually incorporating removals into the EU ETS in the coming years, my analysis reveals that these systems have been interconnected from the outset. The CRCF relies on existing mechanisms for projecting costs, providing funding, and leveraging socio-technical infrastructures, thereby standardising and legitimising CDR within established market frameworks.

Beyond this institutional embeddedness of the CRCF, I have explored the more fine-grained tools and logics under which CDR is enacted as a market object, placing specific emphasis on the Impact Assessment of the regulation and its preceding reports and surveys. The assessment reports on existing removal solutions and certification mechanisms were analysed to further facilitate this process by translating diverse CDR activities into standardised, comparable formats. Seemingly insignificant artefacts like the 'fiches' – a form that aimed at rendering both removal solutions and existing certification mechanisms equivalent – act as inscription devices (Latour, 1987), distilling complex information and managing uncertainties through projections and flexible classifications. A specific governance approach was thus derived to steer the development of CDR in an experimental manner. This approach assigns markets a decisive role in determining a mix of removal solutions through a 'portfolio' approach (Bright &

Schäfer, 2024), while simultaneously promoting the ideal of a harmonised market structure to ensure coherence and scalability (Barry, 1994).

Beyond this standardisation of CDR as technological artefacts, the consultation process also worked to standardise the kinds of public and stakeholder engagements deemed relevant to the framework. While ostensibly promoting public engagement, it was analysed to have constrained the emergence of engaged publics by actively rendering the input of participants ineffective and dismissing their fundamental criticisms of the establishment of a market-based system *as such* (Blok, 2011). This dynamic underscores a paradox where efforts to democratise policy-making and generate better evidence by including a broad range of actors reinforces technocratic and market-oriented solutions. The CRCF was thus not only analysed for its potential to standardise CDR approaches and methodologies but also to construct a certain notion of a public vis-à-vis CDR by shaping discourse and limiting the scope of acceptable input.

A critical finding in that was the role of a hypothetical *policy baseline scenario*, which depicts the voluntary carbon market as ineffective without EU intervention. This framing not only legitimised the CRCF as a necessary ‘market corrective’ but also actively constructed the conditions under which CDR is standardised and marketised. It parallels practices in carbon accounting, where baselines based on counterfactual scenarios shape what is considered additional or valid (Ehrenstein & Muniesa, 2013), highlighting how institutional practices make some institutional pathways open and foreclose alternative governance models.

Overall, this thesis underscores the performative nature of processes of standardisation and marketisation. Rather than just calling for more inclusive approaches – which I have critiqued in the case of the consultation process – I propose that future research should focus on dissecting and illuminating the institutional practices that shape both markets and publics of CDR, for we cannot afford *not* to perform constructionist studies of climate science and policy (Lahsen, 2023). By making the sub-politics of standardisation transparent, we can gain insights into how governance frameworks are constructed and how they might be navigated or opened up by different actors.

My thesis opens several avenues for future research, particularly in exploring collaborative initiatives of ‘technocratic activism’ that aim to further co-design proposals of CDR in practical and policy contexts. One such initiative is the Co2ol Down project (Carbon Market Watch, 2024), which emerged just at the time of my thesis development. This project brings together “[r]epresentatives from civil society, academia and business [, who] have joined forces to co-design policy proposals that maximise the benefits of carbon removals and slash emissions in the European Union”. Notably, some organisations involved in this collaboration also

participated in the consultations analysed in this thesis, providing a unique opportunity to study continuity and change in their coalition and strategy-building practices.

Future research could delve into how these actors unite under a common framing that seeks to constructively accompany policy processes related to CDR. Investigating the forms of enrollment that have facilitated this collaboration, as well as the forms of contestation that may arise, can offer valuable insights into stakeholder dynamics. Such studies would enhance our understanding of how different organisations negotiate their interests, influence policy developments, and navigate the complexities of marketisation and standardisation beyond mere procedural events (Marres, 2007).

Additionally, further developments in European policymaking as market development will necessitate detailed qualitative assessments. As evidenced in several documents on the CRCF and mirrored in other statements (Schenuit & Preston Aragonés, 2024), debates around integrating carbon removal into systems like the EU ETS will likely intensify. Ethnographic investigations into these debates could yield significant insights, building on prior research into the early design phase of the ETS (Braun, 2009). Such studies would shed light on the specialised policy networks and institutional arrangements that influence these processes, offering a deeper understanding of the evolving governance of carbon removal governance.

10. References

- Akrich, M. (1992). The De-scription of Technical Objects. In W. Bijker & J. Law (Eds.), *Shaping Technology/Building Society. Studies in Sociotechnical Change* (pp. 205–224). MIT Press. <https://shs.hal.science/halshs-00081744>
- Alvial-Palavicino, C. (2015). The Future as Practice. A Framework to Understand Anticipation in Science and Technology. *Tecnoscienza – Italian Journal of Science & Technology Studies*, 6(2), Article 2. <https://doi.org/10.6092/issn.2038-3460/17262>
- Anderson, K., Buck, H. J., Fuhr, L., Geden, O., Peters, G. P., & Tamme, E. (2023). Controversies of carbon dioxide removal. *Nature Reviews Earth & Environment*, 1–7. <https://doi.org/10.1038/s43017-023-00493-y>
- Arcusa, S., & Sprenkle-Hyppolite, S. (2022). Snapshot of the Carbon Dioxide Removal certification and standards ecosystem (2021–2022). *Climate Policy*, 22(9–10), 1319–1332. <https://doi.org/10.1080/14693062.2022.2094308>
- Asayama, S., Hulme, M., & Markusson, N. (2021). Balancing a budget or running a deficit? The offset regime of carbon removal and solar geoengineering under a carbon budget. *Climatic Change*, 167(1–2). <https://doi.org/10.1007/s10584-021-03174-1>
- Asdal, K. (2008). On Politics and the Little Tools of Democracy: A Down-to-Earth Approach. *Distinktion: Journal of Social Theory*, 9(1), 11–26. <https://doi.org/10.1080/1600910X.2008.9672953>
- Asdal, K., Cointe, B., Hobæk, B. (2023). ‘The good economy’: a conceptual and empirical move for investigating how economies and versions of the good are entangled. *BioSocieties* 18, 1–24. <https://doi-org.uaccess.univie.ac.at/10.1057/s41292-021-00245-5>
- Asdal, K., & Reinertsen, H. (2022). *Doing document analysis: A practice-oriented method*. SAGE.

- Asiyanbi, A. P. (2017). Financialisation in the green economy: Material connections, markets-in-the-making and Foucauldian organising actions. *Environment and Planning. A*, 50(3), 531–548. <https://doi.org/10.1177/0308518X17708787>
- Bakker, K. (2007). Trickle Down? Private sector participation and the pro-poor water supply debate in Jakarta, Indonesia. *Geoforum*, 38(5), 855–868. <https://doi.org/10.1016/j.geoforum.2005.11.011>
- Barry, A. (1994). Harmonization and the art of European government. In *Social Change And Political Transformation*. Routledge.
- Beck, S., & Mahony, M. (2017). The IPCC and the politics of anticipation. *Nature Climate Change*, 7(5), 311–313. <https://doi.org/10.1038/nclimate3264>
- Beck, S., & Mahony, M. (2018). The politics of anticipation: The IPCC and the negative emissions technologies experience. *Global Sustainability*, 1, e8. <https://doi.org/10.1017/sus.2018.7>
- Bellamy, R., Chilvers, J., Vaughan, N. E., & Lenton, T. M. (2013). ‘Opening up’ geoengineering appraisal: Multi-Criteria Mapping of options for tackling climate change. *Global Environmental Change*, 23(5), 926–937. <https://doi.org/10.1016/j.gloenvcha.2013.07.011>
- Bey, N., McDonald, H., Maya-Drysdale, L., Stewart, R., Pätz, C., Hornsleth, M. N., Duin, L., Frelih-Larsen, A., Heller, C., & Zakkour, P. (2021). *Certification of Carbon Removals, Part 1: Synoptic review of carbon removal solutions*. Umweltbundesamt GmbH.
- Blok, A. (2011). Clash of the eco-sciences: Carbon marketization, environmental NGOs and performativity as politics. *Economy and Society*, 40(3), 451–476. <https://doi.org/10.1080/03085147.2011.574422>
- Bowker, G. & Star, S. L. (2000). *Sorting things out: Classification and its consequences* (1. MIT press paperback ed.). The MIT Press.

- Brad, A., & Schneider, E. (2023). Carbon dioxide removal and mitigation deterrence in EU climate policy: Towards a research approach. *Environmental Science & Policy*, 150, 103591. <https://doi.org/10.1016/j.envsci.2023.103591>
- Braun, M. (2009). The evolution of emissions trading in the European Union – The role of policy networks, knowledge and policy entrepreneurs. *Accounting, Organizations and Society*, 34(3–4), 469–487. <https://doi.org/10.1016/j.aos.2008.06.002>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Bright, D., & Schäfer, S. (2024). *A comparative study of the sociotechnical imaginaries of marine geoengineering*. https://doi.org/10.3289/oceannets_d2.1
- Bryant, G. (2016). *Carbon markets and the production of climate change*. University of Sidney.
- Burr, V. (2015). *Social Constructionism* (3rd ed.). Routledge. <https://doi.org/10.4324/9781315715421>
- Çalışkan, K., & Callon, M. (2010). Economization, part 2: A research programme for the study of markets. *Economy and Society*, 39(1), 1–32. <https://doi.org/10.1080/03085140903424519>
- Callon, M. (1998a). An Essay on Framing and Overflowing: Economic Externalities Revisited by Sociology. *The Sociological Review*, 46(1_suppl), 244–269. <https://doi.org/10.1111/j.1467-954X.1998.tb03477.x>
- Callon, M. (1998b). *The laws of the markets*. Blackwell.
- Callon, M. (2007). What Does It Mean to Say That Economics Is Performative? In *Do Economists Make Markets?* Princeton University Press. <https://doi.org/10.2307/j.ctv10vm29m.15>

- Callon, M. (2009). Civilizing markets: Carbon trading between in vitro and in vivo experiments. *Accounting, Organizations and Society*, 34(3–4), 535–548. <https://doi.org/10.1016/j.aos.2008.04.003>
- Callon, M., Lascoumes, P., & Barthe, Y. (2011a). *Acting in an uncertain world: An essay on technical democracy*. MIT press.
- Callon, M., Lascoumes, P., & Barthe, Y. (2011b). *Acting in an Uncertain World: An Essay on Technical Democracy*. MIT Press.
- Callon, M., & Muniesa, F. (2005). Peripheral Vision: Economic Markets as Calculative Collective Devices. *Organization Studies*, 26(8), 1229–1250. <https://doi.org/10.1177/0170840605056393>
- Callon, M., & Rabeharisoa, V. (2003). Research “in the wild” and the shaping of new social identities. *Technology in Society*, 25(2), 193–204. [https://doi.org/10.1016/S0160-791X\(03\)00021-6](https://doi.org/10.1016/S0160-791X(03)00021-6)
- Carbon Counts (n.d.). What We Do. Retrieved December 2, 2024, from <https://www.carbon-counts.com/>
- Carbon Market Watch (2024). CO2ol down. Retrieved December 2, 2024, from <https://carbonmarketwatch.org/campaigns/co2ol-down/>
- Carbon Market Watch, Bellona Europa, European Environmental Bureau, ECOS, & fern (2023). NGO Letter on the functioning of the Expert Group on Carbon Removal and its meetings. Retrieved December 2, 2024, from https://carbonmarketwatch.org/publications/joint-ngo-letter-on-the-functioning-of-the-expert-group-on-carbon-removals-and-its-meetings/#pdf_embed
- Carton, W. (2019). ‘Fixing’ Climate Change by Mortgaging the Future: Negative Emissions, Spatiotemporal Fixes, and the Political Economy of Delay. *Antipode*, 51, 750–769. <https://doi.org/10.1111/anti.12532>

- Carton, W., Hougaard, I.-M., Markusson, N., & Lund, J. F. (2023). Is carbon removal delaying emission reductions? *WIREs Climate Change*, 14(4), e826. <https://doi.org/10.1002/wcc.826>
- Cashore, B. W., Auld, G., & Newsom, D. (2004). *Governing through markets: Forest certification and the emergence of non-state authority*. Yale University Press,. <http://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&AN=187990>
- Chilvers, J., & Kearnes, M. (2020). Remaking Participation in Science and Democracy. *Science, Technology, & Human Values*, 45(3), 347–380. <https://doi.org/10.1177/0162243919850885>
- Chilvers, J., Pallet, H., Hargreaves, T., Stephanides, P., & Waller, L. (2022). *An Observatory for Public Engagement with Energy and Climate Change*. <https://doi.org/10.5286/UKERC.EDC.000954>
- Coase, R. H. (1960). The Problem of Social Cost. *The Journal of Law and Economics*, 56(4), 837–877. <https://doi.org/10.1086/674872>
- Cochoy, F. (2008, October 23). *Performativity as Politics: Unlocking Economic Sociology*. Conference, University of Toulouse
- Cointe, B., & Guillemot, H. (2023). A history of the 1.5°C target. *WIREs Climate Change*, 14(3), e824. <https://doi.org/10.1002/wcc.824>
- Collier, S. J., & Lakoff, A. (2021). *The Government of Emergency: Vital Systems, Expertise, and the Politics of Security*. Princeton University Press. <https://doi.org/10.1515/9780691228884>
- Collins, H. M., & Pinch, T. (Eds.). (1998). A new window on the universe: The non-detection of gravitational radiation. In *The Golem: What You Should Know About Science* (2nd ed., pp. 91–108). Cambridge University Press. <https://doi.org/10.1017/CBO9781107295612.010>

- Cox, E., Bellamy, R., & Waller, L. (2024). Public attitudes and emotions toward novel carbon removal methods in alternative sociotechnical scenarios. *Environmental Research Letters*, 19(8), 084026. <https://doi.org/10.1088/1748-9326/ad5dd0>
- Dalsgaard, S. (2016). Carbon Valuation: Alternatives, Alternations and Lateral Measures? *Valuation Studies*, 4(1), Article 1. <https://doi.org/10.3384/VS.2001-5992.164167>
- De Moor, J. (2018). The ‘efficacy dilemma’ of transnational climate activism: The case of COP21. *Environmental Politics*, 27(6), 1079–1100. <https://doi.org/10.1080/09644016.2017.1410315>
- Dewey, J. (1927). *The public & its problems*. Swallow Press
- Doganova, L., & Laurent, B. (2016). Keeping things different: Coexistence within European markets for cleantech and biofuels. *Journal of Cultural Economy*, 9(2), 141–156. <https://doi.org/10.1080/17530350.2015.1110530>
- Doganova, L., & Laurent, B. (2019). Carving out a domain for the market: Boundary making in European environmental markets. *Economy and Society*, 48(2), 221–242. <https://doi.org/10.1080/03085147.2019.1624071>
- Dolez, A., Céline, G., & Séverine, L. (2019). On the Plurality of Environmental Regimes of Anticipation: Insights from Forest Science and Management. *Science & Technology Studies*, 32(4), Article 4. <https://doi.org/10.23987/sts.64919>
- Donald Mackenzie. (2006). *An Engine, Not a Camera: How Financial Models Shape Markets*. The MIT Press. <https://uaccess.univie.ac.at/login?url=https://search.ebsco-host.com/login.aspx?direct=true&AuthType=ip,shib&db=nlebk&AN=156955&site=ehost-live>
- Ecologic Institute. (n.d.). About us. Retrieved December 2, 2024, from <https://www.ecologic.eu/about>

- Ehrenstein, V. (2022). Technocratic activism: Environmental organisations, carbon markets and European bureaucracy. In Andreas Birkbak & Irina Papazu (Eds.), *Democratic Situations* (pp. 60–79). Mattering Press.
- Ehrenstein, V., & Muniesa, F. (2013). The Conditional Sink: Counterfactual Display in the Valuation of a Carbon Offsetting Reforestation Project. *Valuation Studies*, 1(2), Article 2. <https://doi.org/10.3384/vs.2001-5992.1312161>
- Environment Agency Austria. (n.d.). About us. Retrieved December 2, 2024, from <https://www.umweltbundesamt.at/en/about-us>
- European Commission (n.d.-a). Scope of the EU ETS. Retrieved December 4, 2024, from https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/scope-eu-ets_en
- European Commission. (n.d.-b). Certification of carbon removals – EU rules. European Commission. Retrieved December 2, 2024, from https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13172-Certification-of-carbon-removals-EU-rules_en
- European Commission. (n.d.-c). Impact assessments. Retrieved December 2, 2024, from https://commission.europa.eu/law/law-making-process/planning-and-proposing-law/impact-assessments_en
- European Commission. (n.d.-d). Regulatory Scrutiny Board. Retrieved December 2, 2024, from https://commission.europa.eu/law/law-making-process/regulatory-scrutiny-board_en
- European Commission. (2015). *COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Closing the loop—An EU action plan for the Circular Economy*. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52015DC0614>

European Commission (2018). *A Clean Planet for all. A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy.* <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0773>

European Commission (2019). *The European Green Deal.* <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52019DC0640>

European Commission. (2020a). *COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A new Circular Economy Action Plan For a cleaner and more competitive Europe.* <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN>

European Commission. (2020b). *COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system.* <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0381>

European Commission. (2021a). *COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL Sustainable Carbon Cycles.* <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC0800>

European Commission (2021b). *European Climate Law.* <https://eur-lex.europa.eu/EN/legal-content/summary/european-climate-law.html>

European Commission (2021c). *Better Regulation Agenda. Joining Forces to Make Better Laws.* https://commission.europa.eu/document/199176cf-6c4e-48ad-a9f7-9c1b31bbbd09_en?prefLang=de

European Commission. (2022a). *A European Union Regulatory Framework for the Certification of Carbon Removals.* https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=pi_com%3AAres%282022%29869812

European Commission (2022b). Summary Report on the Open Public Consultation on the Certification of Carbon Removals – EU Rules. https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13172-Certification-of-carbon-removals-EU-rules/public-consultation_en

European Commission. (2022c). *COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT REPORT Accompanying the document Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing a Union certification framework for carbon removals. Part 1/2.*

European Commission. (2022d). *COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT REPORT Accompanying the document Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing a Union certification framework for carbon removals. Part 2/2.*

European Commission. (2022e). *Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing a Union certification framework for carbon removals.* <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022PC0672>

European Commission. (2022f). Expert group on carbon removals [Database entry]. Retrieved December 4, 2024, from <https://ec.europa.eu/transparency/expert-groups-register/screen/expert-groups/consult?lang=en&groupID=3861>

European Commission. (2022g). Call for Applications for the Selection of Members of the Expert Group on Carbon Removals. Retrieved December 2, 2024, from <https://ec.europa.eu/transparency/expert-groups-register/screen/expert-groups/consult?lang=en&groupID=3861>

European Commission. (2022h). EU carbon market report: Driving emission reductions and enabling climate and energy investment. Retrieved December 2, 2024, from

https://climate.ec.europa.eu/news-your-voice/news/eu-carbon-market-report-driving-emission-reductions-and-enabling-climate-and-energy-investment-2022-12-14_en

European Commission. (2024a). *Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing a Union certification framework for permanent carbon removals, carbon farming and carbon storage in products*. Retrieved December 2, 2024, from https://www.europarl.europa.eu/meetdocs/2014_2019/plmrep/COMMITTEES/ENVI/DV/2024/03-11/Item9-Provision-alagreement-CFCR_2022-0394COD_EN.pdf

European Commission. (2024b). *COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Towards an ambitious Industrial Carbon Management for the EU*. Retrieved December 2, 2024, from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2024%3A62%3AFIN>

Felt, U., & Fochler, M. (2010). Machineries for Making Publics: Inscribing and Describing Publics in Public Engagement. *Minerva*, 48(3), 219–238. <https://doi.org/10.1007/s11024-010-9155-x>

Fourcade, M., & Healy, K. (2013). Classification situations: Life-chances in the neoliberal era. *Accounting, Organizations and Society*, 38(8), 559–572. <https://doi.org/10.1016/j.aos.2013.11.002>

Frankel, C., Ossandón, J., & Pallesen, T. (2019). The organization of markets for collective concerns and their failures*. *Economy and Society*, 48(2), 153–174. <https://doi.org/10.1080/03085147.2019.1627791>

Fuss, S., Canadell, J. G., Peters, G. P., Tavoni, M., Andrew, R. M., Ciais, P., Jackson, R. B., Jones, C. D., Kraxner, F., Nakicenovic, N., Le Quéré, C., Raupach, M. R., Sharifi, A., Smith, P., & Yamagata, Y. (2014). Betting on negative emissions. *Nature Climate Change*, 4(10), 850–853. <https://doi.org/10.1038/nclimate2392>

- Geden, O. (2016). The Paris Agreement and the inherent inconsistency of climate policymaking. *WIREs Climate Change*, 7(6), 790–797. <https://doi.org/10.1002/wcc.427>
- Goffman, E. (1974). *Frame analysis: An essay on the organization of experience*. Harper and Row.
- Guillemot, H. (2022). Climate Models. In K. De Pryck (Ed.), *A Critical Assessment of the Intergovernmental Panel on Climate Change* (1st ed., pp. 126–136). Cambridge University Press. <https://doi.org/10.1017/9781009082099.018>
- Hagendijk, R., & Irwin, A. (2006). Public Deliberation and Governance: Engaging with Science and Technology in Contemporary Europe. *Minerva*, 44(2), 167–184. <https://doi.org/10.1007/s11024-006-0012-x>
- Hale, T., Smith, S. M., Black, R., Cullen, K., Fay, B., Lang, J., & Mahmood, S. (2022). Assessing the rapidly-emerging landscape of net zero targets. *Climate Policy*, 22(1), 18–29. <https://doi.org/10.1080/14693062.2021.2013155>
- Healey, P., Kruger, T., & Lezaun, J. (2024). Responsible innovation in CDR: Designing sustainable national Greenhouse Gas Removal policies in a fragmented and polycentric governance system. *Frontiers in Climate*, 5, 1293650. <https://doi.org/10.3389/fclim.2023.1293650>
- Hilser, H., Hiraldo, L., Moreau, C., Draiby, A., Cox, E., Andrews, M. G., Winks, L., & Walworth, N. G. (2024). Public engagement and collaboration for carbon dioxide removal: Lessons from a project in the Dominican Republic. *Frontiers in Climate*, 6. <https://doi.org/10.3389/fclim.2024.1290999>
- Hougaard, I.-M. (2024). Enacting biochar as a climate solution in Denmark. *Environmental Science & Policy*, 152, 103651(1-9). <https://doi.org/10.1016/j.envsci.2023.103651>
- Hull, M. S. (2012). Documents and Bureaucracy. *Annual Review of Anthropology*, 41(1), 251–267. <https://doi.org/10.1146/annurev.anthro.012809.104953>

- Hulme, M. (2010). Problems with making and governing global kinds of knowledge☆. *Global Environmental Change*, 20(4), 558–564. <https://doi.org/10.1016/j.gloenvcha.2010.07.005>
- Hulme, M. (2011). Reducing the Future to Climate: A Story of Climate Determinism and Reductionism. *Osiris*, 26(1), 245–266. <https://doi.org/10.1086/661274>
- Intergovernmental Panel on Climate Change (IPCC). (2022). *Global Warming of 1.5°C: IPCC Special Report on Impacts of Global Warming of 1.5°C above Pre-industrial Levels in Context of Strengthening Response to Climate Change, Sustainable Development, and Efforts to Eradicate Poverty* (1st ed.). Cambridge University Press. <https://doi.org/10.1017/9781009157940>
- Jasanoff, S. (1998). The political science of risk perception. *Reliability Engineering & System Safety*, 59(1), 91–99. [https://doi.org/10.1016/S0951-8320\(97\)00129-4](https://doi.org/10.1016/S0951-8320(97)00129-4)
- Jasanoff, S. (2007). Technologies of humility. *Nature*, 450(7166), 33–33. <https://doi.org/10.1038/450033a>
- Kalpana Shankar, David Hakken, & Carsten Osterlund. (2017). Rethinking Documents. In U. Felt, R. Fouche, C. A. Miller, & L. Smith-Doerr (Eds.), *The Handbook of Science and Technology Studies, fourth edition*. MIT Press.
- Knox-Hayes, J. (2013). The spatial and temporal dynamics of value in financialization: Analysis of the infrastructure of carbon markets. *Geoforum*, 50, 117–128. <https://doi.org/10.1016/j.geoforum.2013.08.012>
- Lahn, B. (2020). A history of the global carbon budget. *WIREs Climate Change*, 11(3), e636. <https://doi.org/10.1002/wcc.636>
- Lahsen, M. (2023). We Cannot Afford Not to Perform Constructionist Studies of Mainstream Climate Science. In Z. Baker, T. Law, M. Vardy, & S. Zehr (Eds.), *Climate, Science and Society: A Primer* (1st ed.). Routledge. <https://doi.org/10.4324/9781003409748>

- Lane, R. (2012). The promiscuous history of market efficiency: The development of early emissions trading systems. *Environmental Politics*, 21(4), 583–603.
<https://doi.org/10.1080/09644016.2012.688355>
- Latour, B. (1987). *Science in Action. How to Follow Scientists and Engineers through Society*. Harvard University Press.
- Latour, B. (1990). Drawing things together. In M. Lynch & S. Woolgar (Eds.), *Representation in Scientific Practice* (pp. 19–68). MIT Press.
- Latour, B. (1994). Pragmatogonies: A Mythical Account of How Humans and Nonhumans Swap Properties. *American Behavioral Scientist*, 37(6), 791–808.
<https://doi.org/10.1177/0002764294037006006>
- Latour, B. (2005). *Reassembling the Social: An Introduction to Actor-Network-Theory*. Oxford University Press, Incorporated,. <https://ebookcentral.proquest.com/lib/univie/detail.action?docID=422646>
- Latour, B., & Woolgar, S. (1979). *Laboratory Life. The Construction of Scientific Facts*. Princeton University Press.
- Laurent, B. (2022). *European Objects: The Troubled Dreams of Harmonization*. The MIT Press.
<https://doi.org/10.7551/mitpress/13781.001.0001>
- Law, J. (2008). Actor Network Theory and Material Semiotics. In *The New Blackwell Companion to Social Theory* (pp. 141–158). Wiley-Blackwell.
<https://doi.org/10.1002/9781444304992.ch7>
- Law, J. (2009). Seeing Like a Survey. *Cultural Sociology*, 3(2), 239–256.
<https://doi.org/10.1177/1749975509105533>
- Law, J., & Callon, M. (1988). Engineering and Sociology in a Military Aircraft Project: A Network Analysis of Technological Change*. *Social Problems*, 35(3), 284–297.
<https://doi.org/10.2307/800623>

- Levy, D. M. (2001). *Scrolling Forward: Making Sense of Documents in the Digital Age*. Arcade Publishing.
- Lezaun, J., & Soneryd, L. (2007). Consulting citizens: Technologies of elicitation and the mobility of publics. *Public Understanding of Science*, 16(3), 279–297. <https://doi.org/10.1177/0963662507079371>
- Lippert, I. (2015). Environment as datascape: Enacting emission realities in corporate carbon accounting. *Geoforum*, 66, 126–135. <https://doi.org/10.1016/j.geoforum.2014.09.009>
- Lippmann, W. (1925). *The Phantom Public*. Routledge. <https://doi.org/10.4324/9781315133812>
- Liu, J. C.-E., & Cooper, M. H. (2020). Carbon Markets and International Environmental Governance. In J. C. Keller, K. Legun, M. Carolan, & M. M. Bell (Eds.), *The Cambridge Handbook of Environmental Sociology* (Vol. 2, pp. 267–284). Cambridge University Press. <https://doi.org/10.1017/9781108554558.018>
- Lohmann, L. (2005). Marketing and making carbon dumps: Commodification, calculation and counterfactuals in climate change mitigation. *Science as Culture*, 14(3), 203–235. <https://doi.org/10.1080/09505430500216783>
- Lund, J. F., Markusson, N., Carton, W., & Buck, H. J. (2023). Net zero and the unexplored politics of residual emissions. *Energy Research & Social Science*, 98, 103035. <https://doi.org/10.1016/j.erss.2023.103035>
- Mace, G. M. (2014). Whose conservation? *Science*, 345(6204), 1558–1560. <https://doi.org/10.1126/science.1254704>
- MacKenzie, D. (2007). Is economics performative? Option theory and the construction of derivatives markets. In D. MacKenzie, F. Muniesa & L. Siu. In D. MacKenzie, F. Muniesa, & L. Siu (Eds.), *Do economists make markets? On the performativity of economics*. Princeton University Press.

- Mackenzie, D. (2009a). Making things the same: Gases, emission rights and the politics of carbon markets. *Accounting, Organizations and Society*, 34(3–4), 440–455. <https://doi.org/10.1016/j.aos.2008.02.004>
- Mackenzie, D. (2009b). *Material markets: How economic agents are constructed* (1. publ.). Oxford Univ. Press.
- Markusson, N., Buck, H. J., Carton, W., Hougaard, I.-M., Dooley, K., & Lund, J. F. (2024). Carbon removal and the empirics of climate delay. *Environmental Science & Policy*, 161, 103884. <https://doi.org/10.1016/j.envsci.2024.103884>
- Markusson, N., McLaren, D., & Tyfield, D. (2018). Towards a cultural political economy of mitigation deterrence by negative emissions technologies (NETs). *Global Sustainability*, 1. <https://doi.org/10.1017/sus.2018.10>
- Marres, N. (2007). The Issues Deserve More Credit: Pragmatist Contributions to the Study of Public Involvement in Controversy. *Social Studies of Science*, 37(5), 759–780. <https://doi.org/10.1177/0306312706077367>
- Marres, N. S. (2005). *No issue, no public: Democratic deficits after the displacement of politics*. <https://dare.uva.nl/search?identifier=b560e412-6abd-44bd-be7a-1122b4bda308>
- McDonald, H., Bey, N., Duin, L., Frelih-Larsen, A., Maya-Drysdale, L., Stewart, R., Pätz, C., Hornsleth, M. N., Berndt, C., & Zakkour, P. (2021). *Certification of Carbon Removals. Part 2: A review of carbon removal certification mechanisms and methodologies*. Umweltbundesamt GmbH.
- McGoey, L. (2012). The logic of strategic ignorance. *The British Journal of Sociology*, 63(3), 533–576. <https://doi.org/10.1111/j.1468-4446.2012.01424.x>
- Michael, M. (2017). *Actor-network theory: Trials, trails and translations*. SAGE.
- Michael, M., & Brown, N. (2005). Scientific citizenships: Self-representations of xenotransplantation's publics. *Science as Culture*, 14(1), 39–57. <https://doi.org/10.1080/09505430500041769>

- Michaelowa, A., Honegger, M., Poralla, M., Winkler, M., Dalfiume, S., & Nayak, A. (2023). International carbon markets for carbon dioxide removal. *PLOS Climate*, 2(5), e0000118. <https://doi.org/10.1371/journal.pclm.0000118>
- Möller, I. (2020). Winning Hearts and Minds? Explaining the Rise of the Geoengineering Idea. In J. P. Sapinski, H. J. Buck, & A. Malm (Eds.), *Has It Come to This?: The Promises and Perils of Geoengineering on the Brink*. Rutgers University Press. <https://doi.org/10.36019/9781978809390>
- Möller, I. (2023). Geoengineering and Public Policy. Framing, Research, and Deployment. In H. Jörgens, C. Knill, & Y. Steinebach, *Routledge Handbook of Environmental Policy* (1st ed., pp. 381–399). Routledge. <https://doi.org/10.4324/9781003043843-31>
- Myers, R., Larson, A. M., Ravikumar, A., Kowler, L. F., Yang, A., & Trench, T. (2018). Messiness of forest governance: How technical approaches suppress politics in REDD+ and conservation projects. *Global Environmental Change*, 50, 314–324. <https://doi.org/10.1016/j.gloenvcha.2018.02.015>
- Nerlich, B., Morris, C., Price, C., & Harris, H. (2023). Biochar in the British print news media: An analysis of promissory discourse and the creation of expectations about carbon removal. *Science as Culture*, 0(0), 1–25. <https://doi.org/10.1080/09505431.2023.2285057>
- Osaka, S., Bellamy, R., & Castree, N. (2021). Framing “nature-based” solutions to climate change. *WIREs Climate Change*, 12(5), e729. <https://doi.org/10.1002/wcc.729>
- Otto, D., & Matzner, N. (2024). Let Us Get Regional: Exploring Prospects for Biomass-Based Carbon Dioxide Removal on the Ground. *C*, 10(1), Article 1. <https://doi.org/10.3390/c10010025>
- Pallett, H., & Chilvers, J. (2013). A Decade of Learning about Publics, Participation, and Climate Change: Institutionalising Reflexivity? *Environment and Planning A: Economy and Space*, 45(5), 1162–1183. <https://doi.org/10.1068/a45252>

- Palm, E., Tilsted, J. P., Vogl, V., & Nikoleris, A. (2024). Imagining circular carbon: A mitigation (deterrence) strategy for the petrochemical industry. *Environmental Science & Policy*, 151, 103640. <https://doi.org/10.1016/j.envsci.2023.103640>
- Paterson, M., & Stripple, J. (2014). Virtuous carbon. In Benjamin Stephan & Richard Lane (Eds.), *The Politics of Carbon Markets*. Routledge.
- Paterson, M., Wilshire, S., & Tobin, P. (2023). The Rise of Anti-Net Zero Populism in the UK: Comparing Rhetorical Strategies for Climate Policy Dismantling. *Journal of Comparative Policy Analysis: Research and Practice*, 0(0), 1–19. <https://doi.org/10.1080/13876988.2023.2242799>
- Paul N. Edwards. (2010). *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming*. The MIT Press. <https://uaccess.univie.ac.at/login?url=https://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,shib&db=nlebk&AN=343488&site=ehost-live>
- Perino, G. (2024). Carbon market design and market sentiment. *Journal of Environmental Economics and Management*, 128, 103057. <https://doi.org/10.1016/j.jeem.2024.103057>
- Pfotenhauer, S., & Jasanoff, S. (2017). Panacea or diagnosis? Imaginaries of innovation and the ‘MIT model’ in three political cultures. *Social Studies of Science*, 47(6), 783–810. <https://doi.org/10.1177/0306312717706110>
- Price, C., Morris, J., & Morris, C. (2024). Biochar carbon markets: A mitigation deterrence threat. *Environmental Science & Policy*, 154, 103704. <https://doi.org/10.1016/j.envsci.2024.103704>
- Prior, L. (2008). Repositioning Documents in Social Research. *Sociology*, 42(5), 821–836. <https://doi.org/10.1177/0038038508094564>
- Ramboll (n.d.). Who we are. Retrieved December 2, 2024, from <https://www.ramboll.com/who-we-are>

- Randalls, S. (2010). History of the 2°C climate target. *WIREs Climate Change*, 1(4), 598–605. <https://doi.org/10.1002/wcc.62>
- Riles, A. (2006). *Documents: Artifacts of modern knowledge*. the University of Michigan press.
- Rivas, C. (2017). Finding themes in qualitative data. In C. Seale & C. Rivas (Eds.), *Researching Society and Culture*. Sage.
- Rogelj, J., Geden, O., Cowie, A., & Reisinger, A. (2021). Net-zero emissions targets are vague: Three ways to fix. *Nature*, 591(7850), 365–368. <https://doi.org/10.1038/d41586-021-00662-3>
- Schenuit, F., Gidden, M. J., Boettcher, M., Brutschin, E., Fyson, C., Gasser, T., Geden, O., Lamb, W. F., Mace, M. J., Minx, J., & Riahi, K. (2023). Secure robust carbon dioxide removal policy through credible certification. *Communications Earth & Environment*, 4(1), 349. <https://doi.org/10.1038/s43247-023-01014-x>
- Schenuit & Preston Aragonés. (2024). Broadening the carbon removal debate beyond the ETS. Retrieved December 6, 2024, from <https://www.euractiv.com/section/eet/opinion/broadening-the-carbon-removal-debate-beyond-the-ets/>
- Schubert, J. (2022). Science-state alliances and climate engineering: A ‘longue durée’ picture. *WIREs Climate Change*, 13(6), e801. <https://doi.org/10.1002/wcc.801>
- Schumacher, J. M. (2023). Framing REDD+: Political ecology, actor–network theory (ANT), and the making of forest carbon markets. *Geographica Helvetica*, 78(2), 255–265. <https://doi.org/10.5194/gh-78-255-2023>
- Sloot, D., & Bostrom, A. (2024). The role of framing in public support for direct air capture: A moral hazard survey experiment in the United States. *Energy Research & Social Science*, 116, 103694. <https://doi.org/10.1016/j.erss.2024.103694>
- Smith, S. M., Geden, O., Nemet, G., Gidden, M., Lamb, W. F., Powis, C., Bellamy, R., Callaghan, M., Cowie, A., Cox, E., Fuss, S., Gasser, T., Grassi, G., Greene, J., Lück, S., Mohan, A., Müller-Hansen, F., Peters, G., Pratama, Y., Repke, T., Riahi, K., Schenuit,

- F., Steinhauser, J., Strefler, J., Valenzuela, J. M., and Minx, J. C. (2023). The State of Carbon Dioxide Removal 1st Edition. Available at: <https://www.stateofcdr.org>
- Sovacool, B. K., Baum, C. M., Cantoni, R., & Low, S. (2024). Actors, legitimacy, and governance challenges facing negative emissions and solar geoengineering technologies. *Environmental Politics*, 33(2), 340–365. <https://doi.org/10.1080/09644016.2023.2210464>
- Swyngedouw, E. (2011). *Depoliticized Environments: The End of Nature, Climate Change and the Post-Political Condition*.
- Turnau, S., Jaspers, D., Marxen, A., Naims, H., de Bruyn, S., Bringezu, S., Kaiser, S., Gimnes Jarøy, A., Porteron, S., Ombudstvedt, I., Ellingsen Gran, M., Le Den, X., Zotz, F., Olfe-Kräutlein, B., & Bruijne, E. (2019). Identification and analysis of promising carbon capture and utilisation technologies, including their regulatory aspects: final report, Publications Office. <https://data.europa.eu/doi/10.2834/348288>
- Valenzuela, J. M., & Lezaun, J. (2024). Publics and counter-publics of net-zero. *Futures*, 156, 103322. <https://doi.org/10.1016/j.futures.2024.103322>
- Venturini, T. (2010). Diving in magma: How to explore controversies with actor-network theory. *Public Understanding of Science*, 19(3), 258–273. <https://doi.org/10.1177/0963662509102694>
- Völker, T., Kovacic, Z., & Strand, R. (2020). Indicator development as a site of collective imagination? The case of European Commission policies on the circular economy. *Culture and Organization*, 26(2), 103–120. <https://doi.org/10.1080/14759551.2019.1699092>
- von Rothkirch, J., Ejderyan, O., & Stauffacher, M. (2024). Carbon dioxide removal: A source of ambition or of delays? Examining expectations for CDR in Swiss climate policy. *Environmental Science & Policy*, 153, 103659. <https://doi.org/10.1016/j.envsci.2023.103659>

- Voß, J.-P., & Amelung, N. (2016). Innovating public participation methods: Technoscientization and reflexive engagement. *Social Studies of Science*, 46(5), 749–772. <https://doi.org/10.1177/0306312716641350>
- Waller, L., Cox, E., & Bellamy, R. (2023a). Carbon removal demonstrations and problems of public perception. *WIREs Climate Change*, 15(1), e857. <https://doi.org/10.1002/wcc.857>
- Waller, L., Rayner, T., & Chilvers, J. (2023b). Searching for a Public in Controversies over Carbon Dioxide Removal: An Issue Mapping Study on BECCS and Afforestation. *Science, Technology, & Human Values*, 48(1), 34–67. <https://doi.org/10.1177/01622439211043568>
- Wynne, B. (1992a). Misunderstood misunderstanding: Social identities and public uptake of science. *Public Understanding of Science*, 1(3), 281–304. <https://doi.org/10.1088/0963-6625/1/3/004>
- Wynne, B. (1992b). Public understanding of science research: New horizons or hall of mirrors? *Public Understanding of Science*, 1(1), 37–43. <https://doi.org/10.1088/0963-6625/1/1/008>

11. Annex

11.1. Codebook for Analysing NGO Engagement

socio-material effects of certification mechanisms
problem with baselines for landowners
MRV as experimentation
voluntary carbon markets
costs of the real-world experiment
autonomy of farmers
compliance markets
separation of reduction and removal targets
carbon markets and land issues
fungibility of removals
alternative governance approaches
pro-market
unfair market conditions
risk of MRV costs
risk of price volatility
public funding
offsetting
condition of the voluntary carbon market
connection between MRV and voluntary carbon markets
criticism towards the consultation as a market device

11.2. Questionnaire – Call for Evidence, European Commission 2024

Question 1: What in your view are the main challenges regarding the integration of carbon removal in EU climate policies? *(Select up to three options)*

- Ensuring a net contribution from removals to the achievement of climate neutrality.
- Providing sufficient guarantees for the duration of carbon storage and the prevention of reversals.
- Avoiding potential negative environmental impacts and complying with sustainability principles.
- Fostering cost-effective carbon removal solutions.
- Guaranteeing transparency of the benefits and costs of carbon removals.
- Ensuring that strong action to reduce emissions is not undermined by shifting focus on carbon removals.
- Ensuring precise, accurate and timely measurement for removals.
- Setting appropriate baseline and demonstrating the additionality of removals.
- Other.

Please specify:

Question 2: What should be the main criteria defining the types of carbon removals that EU climate policies should incentivise? *(Select up to three options)*

- Potential social benefits
- Risk of intentional or unintentional reversal of carbon removals
- Robustness of monitoring, reporting and verification aspects
- Affordability of monitoring, reporting and verification aspects
- Duration of carbon storage
- Potential environmental co-benefits
- Technical readiness and economic feasibility
- Potential for deployment at large scale
- Other

Please specify:

Question 3⁵: “Q3 gave respondents the possibility to share their views on a series of carbon removal solutions and the time horizon for including them in a certification mechanism. The solutions were split between carbon farming solutions and industrial solutions for carbon removals. For each solution, one-time horizon (as soon as possible, after 2030, towards 2050, or never) could be selected (or no opinion).” (IAR 2, S. 8)

Carbon Farming Solutions

- Carbon farming solutions enhancing ecosystem removals: Afforestation under ecological principles
- Carbon farming solutions enhancing ecosystem removals: Reforestation and forest restoration
- Carbon farming solutions enhancing ecosystem removals: Sustainable forest management
- Carbon farming solutions enhancing ecosystem removals: Agroforestry and mixed farming
- Carbon farming solutions enhancing ecosystem removals: Increase of soil organic carbon on mineral soils
- Carbon farming solutions enhancing ecosystem removals: Increase of soil organic carbon on organic soils
- Carbon farming solutions enhancing ecosystem removals: Wetlands and peatlands restoration
- Carbon farming solutions enhancing ecosystem removals: Coastal marine ecosystem restoration and preservation
- Carbon farming solutions enhancing ecosystem removals: Other

Industrial Solutions for carbon removal

- Industrial solutions for carbon removals: Biochar

⁵ For the third question, there is no literal description of the original question. The question has therefore been taken from the Impact Assessment.

- Industrial solutions for carbon removals: Direct air capture with long-term or permanent carbon storage
 - Industrial solutions for carbon removals: Bioenergy with carbon capture and long-term or permanent storage
 - Industrial solutions for carbon removals: Geological storage of non-fossil CO₂
 - Industrial solutions for carbon removals: Bio-based products with long lifetime (including for construction)
 - Industrial solutions for carbon removals: Utilisation of non-fossil CO₂ in long lifetime products
 - Industrial solutions for carbon removals: Enhanced rock weathering
 - Industrial solutions for carbon removals: Other
-

For each of the solutions, the participants were given three answer options. (*Single-Choice*)

- ☐ as soon as possible
 - ☐ after 2030
 - ☐ towards 2050
 - ☐ never
-

Question 4: Would you agree 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? (*Single-Choice*)

- ☐ Yes
 - ☐ No
 - ☐ No opinion
-

Question 5: What would be the main objectives for the certification of carbon removals? (*Select up to three options*)

- To provide better financial incentives for land managers (e.g. purchasers of food and biomass products reward climate-friendly agriculture through price premiums or incentive payments – often called ‘in-setting’).
- To increase transparency in corporate sustainability reporting and foster the credibility of climate-neutrality claims.
- To support the labelling of sustainable products.
- To provide better public incentives for nature-based and industrial carbon removals in EU and national funding programmes.
- To provide better financial incentives for carbon-storage products (e.g. bio-based products, woody construction material).
- To allow comparability and competition between different carbon removal solutions
- To increase the transparency and level playing field of voluntary carbon markets.
- To provide better public incentives for nature-based and industrial carbon removals in EU and national funding programmes.
- Other.

Please specify:

Question 6: Which role should the EU take in the certification of carbon removals? (*Single-Choice*)

- The EU should establish minimum standard requirements on reporting transparency for carbon removals.
- The EU should establish comprehensive standard requirements for carbon removals, e.g. on monitoring, reporting and verification, on the duration of the removal or baseline setting and additionality.
- Voluntary carbon markets work well. There is no need for an additional intervention by the EU.

Question 7: What functions in the certification process should be carried out by private or public entities? (*All Single-Choice*)

- Establishment of certification methodologies

- Independent private entities.
- Public administration
- No opinion
- Establishment of the system for accreditation of certification bodies
 - Independent private entities.
 - Public administration
 - No opinion
- Validation of the carbon removal project (ex-ante)
 - Independent private entities.
 - Public administration
 - No opinion
- Verification of removals made (ex-post)
 - Independent private entities.
 - Public administration
 - No opinion

Question 8: Carbon removal solutions can differ significantly, for example as regards duration of removals or robustness of monitoring, reporting and verification. In this context, do you think an EU certification framework should allow different types of certificates for different types of removals? (*Single-Choice*)

- The EU certification framework should define only the minimum criteria for the certification and should not comprehensively define the certificates.
- The EU certification framework should only allow a single type of certificate to ensure equivalence of certified carbon removals.
- The EU certification framework should allow different types or sub-categories of certificates to better reflect the diversity of carbon removal solutions and their characteristics.

Question 9: Apart from diverging durations of existing carbon removal solutions, storage may also be prematurely interrupted and carbon may consequently be released back into the

atmosphere. What approach could better manage this risk of intentional or unintentional reversal of carbon removals? *(Multiple-Choice)*

- Require methods with a risk of reversal to be discounted or require a share of the removals to be stored in a buffer account (e.g. 10 to 25 per cent of the expected removal).
- Require commitment to multi-year monitoring plans at the outset of the certification procedure.
- Issue certificates with specific durations (e.g. 5, 7 or 10 years) that can be renewed.
- Encourage or require carbon removal providers to set up insurance systems or multi-project pooling mechanisms.
- Make removal providers liable for any reversal of removals and require them to offset any reversal.
- Other

Please specify:

Question 10: In voluntary carbon markets, the use of baseline and additionality concepts aims to quantify and reward only additional removals, i.e. those that go beyond a pre-identified baseline and would not have occurred in the absence of the incentives. To what extent should the EU certification framework include the concepts of baseline and additionality? *(Single-Choice)*

- The EU certification should establish a single methodology to define the baselines and assess additionality.
- The EU certification framework should allow for a variety of baselines and additionality criteria to cater for different types of removals.
- To best adapt to the use of the certificates in a specific context, the certification framework should not prescribe definitions for baseline and additionality criteria.
- Other

Please specify:

Question 11: What information should the certification for carbon removal disclose? *(Multiple-Choice)*

- Type of carbon removals

- Quantity of carbon removed
- Information on the carbon removal provider
- Information on the certificate owner
- Information on monitoring, reporting and verification processes
- Duration of carbon storage
- Risk coverage and safeguards on sustainability objectives
- Information on the use of the certificate and its contribution to the Paris Agreement with a view to avoiding double counting
- Environmental benefits
- Social benefits
- Price if the certificate has been traded
- To best adapt to the use of the certificates in a specific context, the certification framework should not prescribe definitions for baseline and additionality criteria.
- Other

Please specify:

—

Would you have any additional comments on on certification [sic] methodologies, please specify:

—

Finally, are there any other important aspects that should be considered in establishing a regulatory framework for the certification of carbon removals in the EU?

- Yes
- No

Please provide your additional remarks:

11.3. Overview Empirical Data from the Call for Evidence

Call for Evidence					
Ref. No.	Author(s)	Country	Submission Type	Document Name	pages
1	NABU e.V.	Germany	Survey Response		
2	Finnwatch	Finland	Survey Response		
3	IFOAM Organics Europe	Belgium	Survey Response		
4			Position Paper	Organic agriculture and its benefits for climate and biodiversity	16
5			Position Paper	IFOAM Organics Europe position paper on carbon farming and the revision of the LU-LUCF Regulation. Finding synergies between climate action and biodiversity protection	10
6	Earthworm Foundation	Switzerland	Survey Response		
7			Position Paper	Earthworm Foundation's biochar and responsible biochar definitions	2
8	Fertő tó Barátai Egyesület	Hungary	Survey Response		
9			Position Paper	Additional remarks to carbon removal certification consultation	2
10	European Environmental Bureau	Belgium	Survey Response		
11	Ecosystem Value Association e.V.	Germany	Survey Response		
12			Position Paper	Feedback to the EU-Commission regarding: The proposal for a regulation of Certification of Carbon Removals	3
13	Action Solidarité Tiers Monde	Luxembourg	Survey Response		
14	Climate Action Network Europe	Belgium	Survey Response		
15	AirClim	Sweden	Survey Response		
16	Carbon Market Watch	Belgium	Survey Response		
17			Position Paper	Above and Beyond Carbon Offsetting. Alternative to Compensation for Climate Action and Sustainable Development	14
18			Position Paper	Respecting the laws of physics. Principles for Carbon Dioxide Removal Accounting	33

19	Environmental Coalition on Standards	Belgium	Survey Response		
20			Position Paper	EU rules for the certification of carbon removals. ECOS Position Paper	6
21	BirdLife Europe and Central Asia	Belgium	Survey Response		
22	Fern	Belgium	Survey Response		
23	Four Paws	Austria	Survey Response		
24	Bellona Europe	Belgium	Survey Response		
25			Position Paper	Bellona Briefing: Addressing differences in permanence of Carbon Dioxide Removal	16
26			Position Paper	Carbon Dioxide Removal: a robust definition and coherent terminology	2
27	ICLEI - Local Governments for Sustainability	Germany	Survey Response		
28	Institute for Agriculture & Trade Policy	USA	Survey Response		
29			Position Paper	Call for evidence: EU Carbon Removals Certification Framework	11
30	CCFD - Terre Solidaire	France	Survey Response		
31	Rewilding Europe & Wetlands International	Netherlands	Survey Response		
32			Position Paper	Joint statement on the importance of wetland and peatland restoration in the establishment of a certification framework on carbon removal	4
33	Carbon Gap	United Kingdom	Survey Response		
34			Position Paper	missing	
35	Submission for ActionAid Europe and ActionAid the Netherlands	Netherlands	Survey Response		
36	Wetlands International European Association	Netherlands	Survey Response		
37			Position Paper	Joint statement on the importance of wetland and peatland restoration in the establishment of a certification framework on carbon removal	4
38			Position Paper	Locking Carbon in Wetlands: Enhancing Climate Action by Including Wetlands in NDCs	2

39			Position Paper	Mediterranean Wetlands Management and Restoration as Carbon Sinks	6
40	Federation of Veterinarians of Europe	Belgium	Survey Response		
41			Position Paper	Veterinarians commit to sustainable food systems	5
42	European Coordination Via Campesina	Belgium	Survey Response		
43			Position Paper	Open letter: The consultation on "Certification of carbon removals" is disingenuous	4
44	European Coordination Via Campesina	France	Survey Response		
45			Position Paper	Lettre ouverte: La consultation sur la "Certification des absorptions de carbone" est fallacieuse	4

12. Abstract in German

Diese Arbeit untersucht, wie das Carbon Removals and Carbon Farming Certification Framework (CRCF) der Europäischen Union CO₂-Entfernung (CDR) in ein Marktojekt verwandelt. Anhand einer detaillierten Analyse von Policy-Dokumenten, Evaluierungsberichten und Konsultationsprozessen werden die Mechanismen dieser Transformation sowie die Auswirkungen auf die Standardisierung und Marktfähigkeit von CDR beleuchtet.

Die Forschung zeigt, dass die Schaffung eines Marktes für CO₂-Entfernung in der EU ein vielschichtiger Prozess ist, bei dem marktwirtschaftliche Logik im gesamten Framework eingebunden wird. So schließt das CRCF die Einführung von Removal-Zertifikaten nicht aus, doch ist dies nur ein erkennbarer Aspekt marktorientierter Ansätze. CO₂-Entfernung wird darüber hinaus als Win-win-Modell präsentiert, das ökonomische und ökologische Ziele vereint, und wird in bestehende CO₂-Marktstrukturen wie das EU-Emissionshandelssystem (EU ETS) integriert. So nutzt die EU sozio-technische Systeme, um Kosten zu projizieren, Finanzierungen zuzuweisen und CDR in etablierten Marktstrukturen zu legitimieren.

Die Arbeit zeigt die Bedeutung von Instrumenten wie regulatorischen Folgenabschätzungen und Klassifikationsmechanismen für die Standardisierung von Entfernungslösungen. Dies ermöglicht eine experimentelle Steuerung im Rahmen eines 'Portfolio'-Ansatzes. Gleichzeitig wird der Prozess der Konsultation des CRCF kritisiert, da externe Beiträge standardisiert und kritische Stimmen ausgeklammert werden, was die Divergenz zwischen marktorientierter Governance und evidenzbasierter Politikgestaltung widerspiegelt.

Ein zentraler Beitrag dieser Forschung ist die Analyse kontrafaktischer politischer Szenarien ('policy baseline scenarios'), die freiwillige Märkte als unzureichend darstellen und das CRCF als notwendigen Schritt zu einer stärkeren "Harmonisierung" legitimieren. Diese Praktiken reflektieren allgemeine Tendenzen in Kohlenstoffmärkten und zeigen, wie institutionelle Rahmenbedingungen bestimmte Governance-Modelle begünstigen und alternative Ansätze marginalisieren.

Die Arbeit fokussiert auf die performative Natur von Markt- und Standardisierungsprozessen und leistet einen Beitrag zu den Debatten über institutionelle Praktiken, die CDR-Märkte und -Öffentlichkeiten gestalten. Sie fordert eine intensivere Auseinandersetzung mit kollaborativer Politikgestaltung sowie ethnographischen Studien zu Marktinfrastrukturen und gewährt Einblicke in die Komplexität der Gestaltung von Governance-Rahmenwerken zur Minderung des Klimawandels.