CARBON REMOVALS HANDBOOK

A FleishmanHillard policy guide to EU carbon sequestration

FLEISHMANHILLARD

FOREWORD

Brussels is embarking on its carbon removals journey to try to tackle the CO_2 already emitted into our atmosphere and the CO_2 emissions we cannot reduce. The first big milestone will be the European Commission's proposal for a carbon removal certification mechanism (CRCM). The challenge will be in setting credible standards for both nature-based removals (such as forestry) and technology-based removals (like direct air capture). The plans for the publication of the CRCM have piqued the interest of some industries but have been greeted with confusion and uncertainty by many, as can be expected from a relatively novel and highly technical matter.

What this handbook therefore sets out to provide is an introduction to carbon removals for a general audience, including policy practitioners and businesses. Accordingly, we will first present an overview of the various types of carbon removal solutions (both nature-based and technological) available to the EU: the 'Carbon Removals Menu'. This will be followed by an overview of the regulatory and political outlook for the certification of carbon removals, including the interaction of the EU certification framework with international initiatives. This should give a flavour of the major points of controversy between countries and stakeholders on this issue, to help you prepare for the upcoming legislative debates.

We hope this handbook will be helpful to you throughout our journey to credible carbon removals.

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Scaling up carbon removals is a new step towards EU climate neutrality, which must not be delayed by the ongoing energy crisis. It will therefore be key to avoid polarisation on natural vs technological removals and create effective incentives for credible carbon removals. This report provides general guidance to carbon removals certification that will mark the beginning of a new era of climate policies in Europe and, hopefully, beyond.

Máximo MICCINILLI

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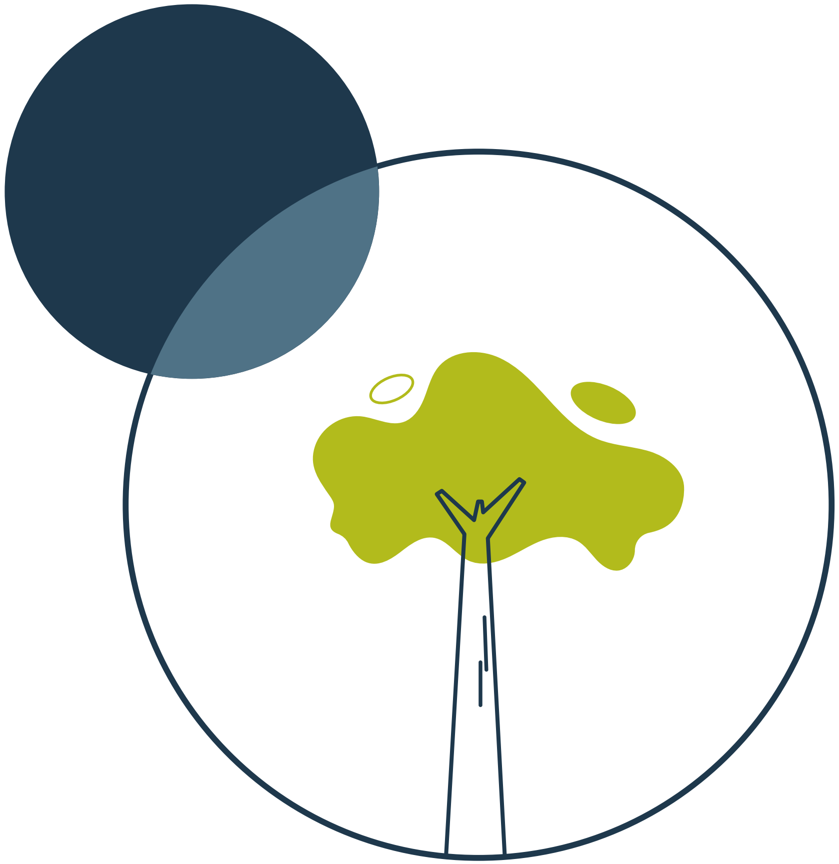
TABLE OF CONTENTS



INTRODUCTION

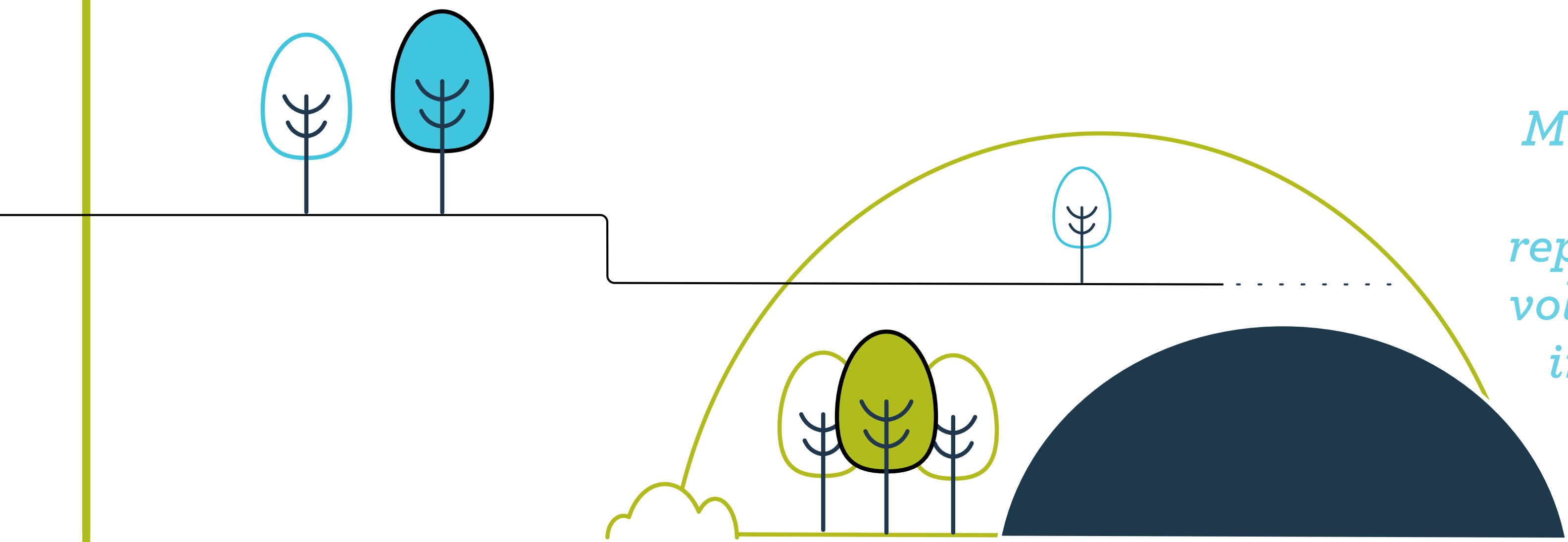
Why do we need Carbon Removals?

The removal of CO_2 is a lesser spoken-of element in our efforts to curb global warming. Instead, measures aimed at reducing greenhouse gas (GHG) emissions dominate national and EU-level climate agendas to meet its 2030 and 2050 targets enshrined in the Climate Law. However, even if great strides are made towards emissions reduction targets, the removal of existing CO_2 will remain crucial to achieve net-zero. This is because lingering CO_2 from decades of fossil fuel production and consumption remain in the atmosphere (at already hazardous levels). Furthermore, emissions from certain sectors of the economy (e.g., agriculture) are naturally occurring, and thus hard to eradicate. This similarly holds for hard-to-abate sectors (e.g., heavy-duty industry and transport) that cannot be fully decarbonised in a cost-effective way.[1] In order to achieve and maintain carbon neutrality in a post-2050 world, these residual emissions will require corresponding removal. For these reasons, it is imperative that emissions reduction efforts are complemented by the removal and permanent storage of CO_2 from the atmosphere.

The rise of Carbon Removals in the EU

The role and importance of carbon removals is beginning to gain traction in public discourse. Indeed, many scenarios – including the most recent IPCC report – factor in significant volumes of carbon removals in the pathway to net-zero emissions.[2] Awareness of the key challenges and opportunities for all stakeholders nonetheless remains nascent. Given its ambitious climate targets, the EU hopes to change this and scale up carbon removal initiatives and practices.

The potential for both technological and nature-based carbon removal solutions in Europe is strong, as has been identified by the European Commission in its Communication on Sustainable Carbon Cycles.[3] Nature-based carbon removal practices are already being deployed in some Member States, for example, in France and Sweden. On the technological front, greater financial constraints and infrastructure considerations mean that such initiatives remain underdeveloped in Europe.



Many scenarios - including the most recent IPCC report - factor in significant volumes of carbon removals in the pathway to net-zero emissions.

EU Carbon Removals Certification Framework

While carbon removals are only now stepping into the spotlight in the EU, they are not completely absent from the European Green Deal policy framework. In fact, several key climate files mention CO_2 removals. Most notably, the European Climate Law addresses the importance of carbon removals and sets a target for net removals by natural carbon sinks (e.g., forests) by 2030.[4] As part of the ongoing revision of the Land Use, Land Use Change and Forestry Regulation (LULUCF), the European Commission has proposed to remove at least 310 Mt of CO_2 equivalent by 2030 through natural carbon sinks.[5] Moreover, the well-known EU Emissions Trading System (EU ETS), which advances CO_2 reductions by mandating installations to purchase allowances for their share of emitted carbon, touches upon some of the aspects that are relevant for technological carbon removals, such as the capture, transportation, and storage of emissions.

Nevertheless, the absence of harmonised EU-wide regulation standards remains a major barrier to the expansion of carbon removal initiatives. Accurately accounting for carbon removals can be a technical and complex process. This is especially the case for nature-based solutions that require intricate modelling. Additionally, when it comes to existing initiatives, actors tend to adhere to different voluntary carbon market certification practices, which results in too much uncertainty to attract the investments needed to scale up removals deployment. The lack of centralised regulation also reduces credibility for stakeholders such as farmers, forest, and installation managers.

Given this credibility challenge and the importance of carbon removals in achieving the Union's climate targets, the European Commission announced that it will propose a framework for harmonised certification of carbon removals in the EU (in November 2022). It will take the form of a regulation complemented by delegated acts, setting strict standards to ensure high-quality carbon removals.

Glossary

» **Carbon removals vs carbon capture**
Carbon removals refer to solutions that sequester CO_2 from the atmosphere. Although carbon can be removed and stored naturally (e.g., through photosynthesis), this report refers specifically to anthropogenic activities, such as through enhancing biological sinks and using chemical engineering to achieve long-term removal and storage.[6]

Carbon capture and storage, on the other hand, refers to a stream of CO_2 that is captured at source (from industrial and other energy-related installations) rather than from the atmosphere, transported and stored for long-term isolation from the atmosphere.[7] In the EU, the rules for safe and permanent storage are laid down by the 2009 CCS Directive.[8]

» **Carbon reduction vs carbon removal vs carbon offset**
A carbon reduction refers to activities aimed at lowering the amount of CO_2 created during a process, providing an ex-ante solution to climate mitigation. In contrast, a carbon removal tackles CO_2 ex-post by sequestering carbon already concentrated in the atmosphere. A carbon offset intends to compensate for the CO_2 already emitted in the atmosphere by providing an emission reduction elsewhere.

» **Carbon sink**
A carbon sink is any method or activity, whether natural or anthropogenic, that removes CO_2 from the atmosphere.

» **Fossil carbon vs atmospheric carbon vs biogenic carbon**
Fossil carbon is CO_2 produced by burning fossil fuels.

Atmospheric carbon is CO_2 captured from the atmosphere through technological methods such as Direct Air Capture.

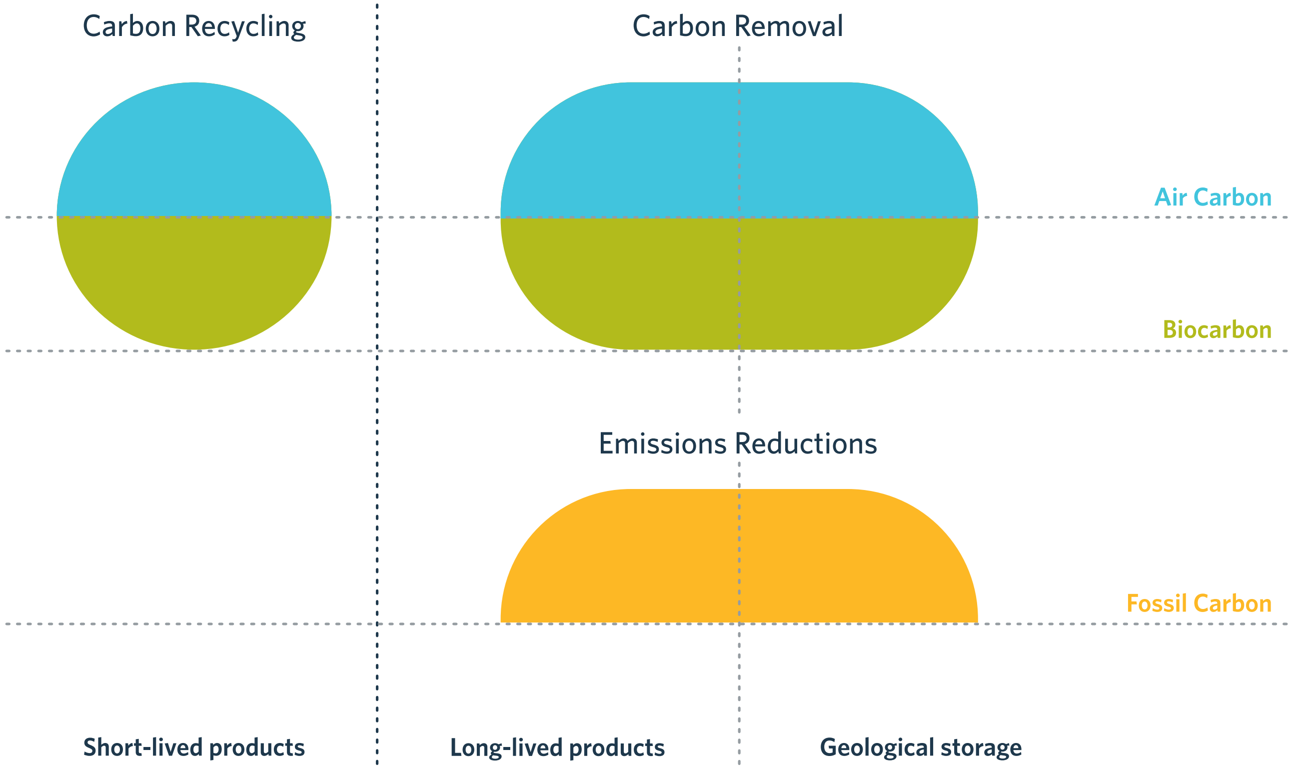
Biocarbon is a type of CO_2 produced by burning or fermenting grasses, trees, or other plants to produce energy.

» **Net-zero vs net-negative vs net-positive**
Net-zero emissions is achieved when the total sum of emissions entering the atmosphere is balanced by the total removal of emissions from the atmosphere. When speaking only of CO_2 emissions, it can be referred to as climate neutrality or carbon neutrality.[9]

Net-negative emissions is achieved when more greenhouse gases are removed from the atmosphere than emitted into it.[10]

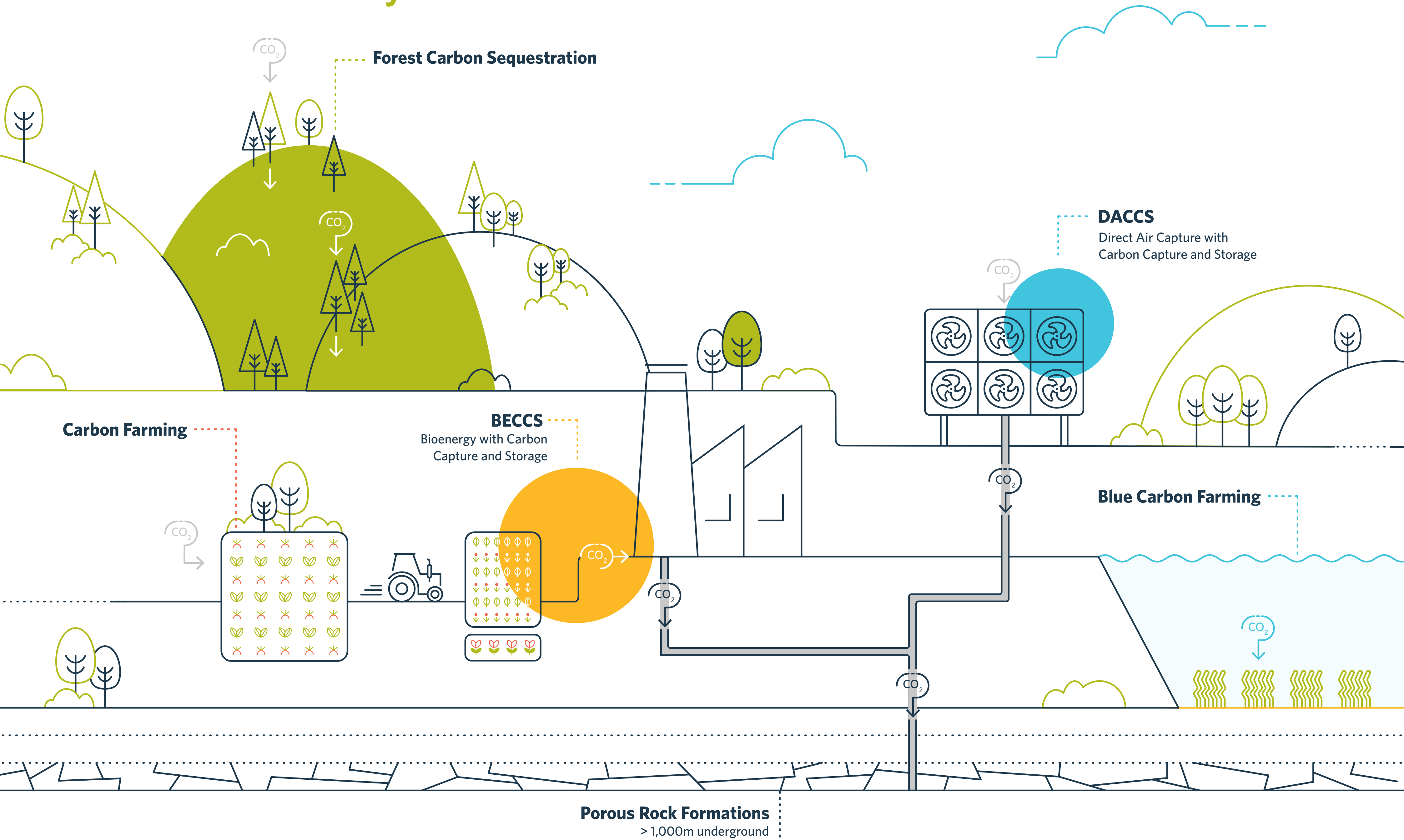
Net-positive emissions refers to a scenario where more greenhouse gases are emitted into the atmosphere than removed from it, which is currently the case.

Where did the carbon come from?



*Graphic courtesy of The Institute for Carbon Removal Law and Policy

Carbon removal cycle



Carbon removals menu

Nature-based solutions: carbon farming

LAND USE[11]

Afforestation, reforestation, forest restoration and sustainable forest management

- Afforestation is the conversion of abandoned and degraded agricultural lands into forests, while reforestation is the replantation of trees in deforested land. Forest restoration is the process of restoring a degraded forest to its original state and to re-establish the presumed structure, productivity and species diversity of the forest originally present at a site.
- Sustainable Forest Management is the human intervention necessary to the maintenance of a functioning forest ecosystem[12] which might include actions such as extending forestlands, creation of protected forests, selective logging and thinning, replanting forests after harvesting, monitoring forests' health, and intervening in case of pests and practices to increase biomass.

Wetlands and peatlands restoration and protection (organic soils)

- Halting the further draining of peatland and wetlands, and rewetting lands that have been ditched or degraded from excessive logging, uncontrolled cattle grazing, or farming.
- Several techniques can be used to restore the lands, including peat dams, plastic piling and bunding, plantation removal, plugging open ditches, or building small dikes.

Targeted conversion of cropland to fallow/set aside areas or to permanent grassland

- Leaving agricultural land without sowing for one or more vegetative cycles or converting permanently to grassland.

Strengths:

- Highest potential to reduce/avoid CO_2 emissions and achieve CO_2 removals.
- Improving biodiversity conservation.
- Increasing/preserving soil organic carbon (SOC) on organic and mineral soils.
- Providing ecosystem services linked to water purification, reduced soil erosion, nutrients leaching and flood peak, pollination services.

Weaknesses:

- Trade-offs resulting from the loss of agricultural land/land-uses competition.
- Potential carbon leakage, due to possible displacement of agricultural production if occurring on previously productive land.
- Concerns on permanence: reversibility risks due to human activity or natural events (e.g., wetlands may be affected by ocean storms/forests burnt down by fires).
- Less profitable as a land-use option for owners and farmers compared to agriculture.
- Peatland/wetland restoration increases methane emissions (though the net GHG effect is negative).

Scorecard (1-4)

●●●●	Mitigation potential
●●●●	Ecosystem benefits
●●●○	Reversibility risks
●●●○	Externalities
●●○○	Profitability for farmers/landowners

Agroforestry

- Agroforestry is a land use management system in which trees or shrubs are grown around or among crops or pastureland.

Strengths:

- No land-use competition with agricultural production.
- Diversified income streams for farms.
- Biodiversity, and wildlife co-benefits (including habitat provision, pollinators and insects).
- Reducing soil erosion and improving soil health, flood protection and reduced nitrate leaching.[13]

Weaknesses:

- Significant reversibility risk due to intentional removal or mismanagement of woody biomass or unintentional reversal due to natural disasters.
- Potential carbon leakage, due to possible reduction of agricultural output.
- Relatively low carbon removal intensity per hectare (compared to other land-use practices).
- Uncertain effects on soil organic carbon (SOC).[14]

Scorecard (1-4)

●●●○	Mitigation potential
●●●●	Ecosystem benefits
●●●○	Reversibility risks
●●○○	Externalities
●●●●	Profitability for farmers/landowners

FARMING[15]

Livestock management

- This includes measures like choosing breeds with lower methane emissions, optimised feeding strategies for livestock and animal waste management.

Strengths:

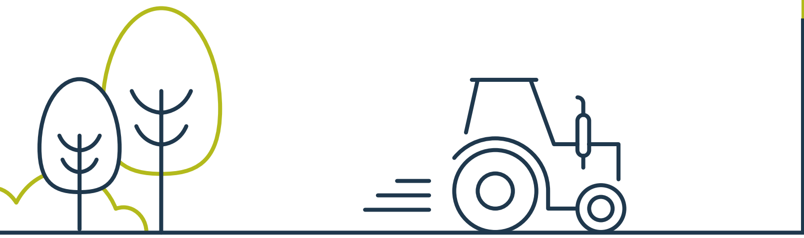
- Cost-effective reduction of GHG emissions as the sector is responsible for 81% of EU agricultural emissions.
- Co-benefits can include reduction of nitrogen and ammonia pollution, water use and increased animal welfare.

Weaknesses:

- Not feasible for carbon sequestration or storage (due to uncertainty and permanence risk).
- Less efficient than other farming/land use practices to produce food at low emission levels.
- Potential externalities such as decreasing local water quality in case of feed additives.

Scorecard (1-4)

●●○○	Mitigation potential
●●○○	Ecosystem benefits
●●○○	Reversibility risks
●●●○	Externalities
●●●●	Profitability for farmers/landowners



Cropland management (use of catch crops, cover crops, conservation tillage etc.) and nutrient management:

- Catch crops & cover crops: a growing crop that can be used as a green manure and to cover the soil surface in the time gap or space gap in between two “true crops”.
- Conservation tillage: minimise the frequency or intensity of tillage operations (working land by ploughing, sowing, and raising crops on).
- Practices including improved crop rotations and nitrogen fixing crops.
- Nutrient and Soil Management: efficient management of nutrient additions avoiding leaching, volatilisation, and emissions to the atmosphere.

Strengths:

- Efficacy in increasing/preserving SOC on mineral soils.
- Reducing soil loss by erosion.
- Improved soil health and water holding capacity, improved biodiversity.
- Increase in agricultural productivity and stability of yields.
- Improved on-farm energy efficiency (decreased use of synthetic fertilisers).

Weakness:

- High risk of reversibility of any gains in SOC in mineral soils.
- Potential for SOC sequestration varies because of the heterogeneity of soils, climatic conditions, existing SOC levels etc.
- Potential carbon leakage, due to possible displacement of agricultural production.

Scorecard (1-4)

●●●○	Mitigation potential
●●●○	Ecosystem benefits
●●●○	Reversibility risks
●●○○	Externalities
●●●○	Profitability for farmers/landowners

Blue carbon ecosystems[16]

Coastal marine ecosystem restoration and preservation & blue carbon farming practices

- Conservation and restoration activities might include establishing marine protected areas for natural recovery and protection; active human intervention for restoration incl. re-seeding and addition of species through specific techniques such as coral cultures or seagrass planting; coastal wetland restoration involving expansion of saltmarshes and seagrass meadows.
- Extension of sustainable aquaculture activities alternative to destructive fishing, incl. seaweed and mollusc regenerative aquaculture.

Strengths

- High potential for carbon storage and sequestration compared to terrestrial ecosystems.
- Increasing/preserving SOC on organic soils.
- Many co-benefits including biodiversity protection, protection of coastland from flood/storms and sea level rise, regulation of water quality and fisheries.
- Increased resilience to ocean acidification.
- Efficiency in trapping carbon from outside its ecosystem boundaries.

Weaknesses

- High reversibility of SOC gains due to human intervention or natural events/disasters, or sea level rise.
- Threats coming from deforestation, nutrient enrichment and coastal exploitation.

Scorecard (1-4)

●●●●	Mitigation potential
●●●●	Ecosystem benefits
●●●○	Reversibility risks
●●○○	Externalities
●●○○	Profitability for farmers/landowners

Technological solutions

DIRECT AIR CAPTURE WITH CARBON STORAGE (DACCS)

DACCS differs from Carbon Capture and Storage (CCS) insofar as it removes CO_2 already in the atmosphere, thus resulting in a net reduction in emissions levels. Contrastingly, CCS is designed to prevent new emissions from fossil fuel production from entering the atmosphere. While CCS is an important technological development, it is not considered a carbon removal process in and of itself.

- DACCS uses chemical reactions to capture CO_2 from the atmosphere.
- There are 2 leading types: liquid solvent and solid sorbent DACCS.
- In liquid DACCS systems, air flows into an installation and is then mixed with a CO_2 absorbent liquid. Once the CO_2 encounters the absorbent, it forms and becomes locked into a carbonate solution, which can then be processed.
- Alternatively, with solid sorbent DACCS, CO_2 binds to a solid substance (or sorbent). This CO_2 is then removed from the sorbent via heat and vaccum processes.

Examples

- Today, there are 18 DACCS plants in operation spanning Europe, the U.S. and Canada – most of which are small facilities, selling CO_2 onto drinks companies, etc.[17]
- While there are no large-scale DACCS plants in operation, three particular companies are pioneering the commercialisation of DACCS technologies: Climeworks, Carbon Engineering, and Global Thermostat.[18]

Strengths

- To absorb the same level of CO2, a DACCS facility require a thousand times less land than trees, making DACCS much less land intensive than some nature-based solutions.
- DACCS can be installed on non-arable land and close to storage locations.
- Limited water usage is required.

Weaknesses

- Energy requirements: Though the type of energy required depends on whether liquid solvent or solid sorbent DACCS is being used, DACCS is extremely energy intensive owing to chemical heating processes.
- DACCS also face significant infrastructure and materials requirements.
- Land requirements: while DACCS installations themselves are not land-intensive, additional land required for renewable energy (such as wind or solar) for the installations can be.
- Geographical challenges: While in theory, the location of DACCS installations is flexible, proximity to i) suitable energy supply infrastructure, and ii) options for geological sequestration are both fundamental.

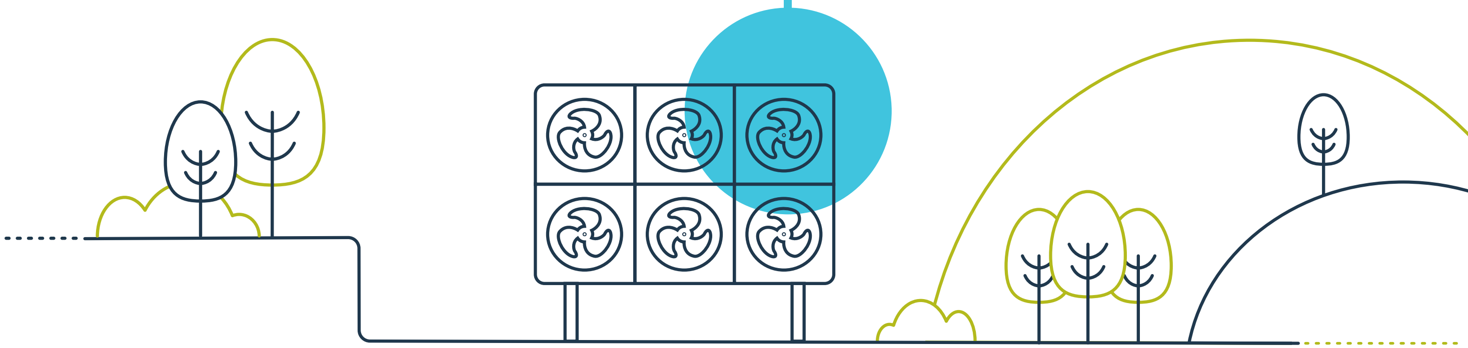
Scorecard (1-4)

●●○○	Land requirements
●●●○	Infrastructure/materials requirements
●○○○	Energy efficiency
●●●○	Water efficiency
●●●●	Storage permanence

Liquid solvent vs solid sorbent DACCS

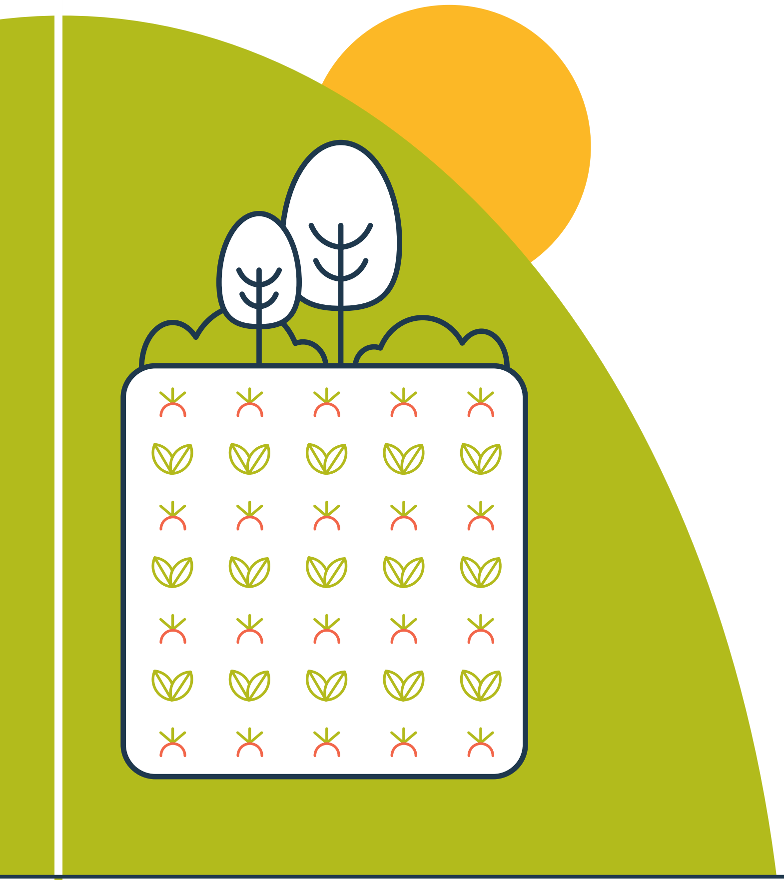
Liquid DACCS systems are relatively inexpensive and easier to produce *en masse*, while also being more cost-effective for producing larger plants.

An important difference between liquid solvent and solid sorbent DAACS is the required temperatures for releasing captured CO_2. While the former requires temperatures reaching 900°C, solid sorbent DACCS only needs a temperature between 80-120°C. This means that liquid solvent DACCS needs natural gas with CCS in order to operate, whereas solid sorbent DACCS can run on renewable or waste energy sources alone.



BIOENERGY WITH CARBON CAPTURE AND LONG-TERM OR PERMANENT STORAGE (BECCS)

Having first appeared in 1998, BECCS is seen as one of the most prominent, developed and cost-effective solutions to carbon removal.[19] Bioenergy production can be regarded as a carbon removal technique when coupled with carbon capture technology.



The process occurs as follows:

- Crops grown on land pull CO_2 from the atmosphere during the photosynthesis process.
- These crops are then harvested and burned to produce bioenergy.
- The CO_2 emitted during the combustion process is then captured using carbon capture technology and subsequently stored underground (in depleted oil and gas reservoirs or aquafers).

While large-scale commercialisation of BECCS still does not exist, IPCC scenarios highlight that the sequestration of around 5 to 10 billion metric tons of CO_2 ($GtCO_2$) annually by 2100 could be necessary to reach climate targets.[20] Specifically, in Europe, approximately 7.5 billion tons of CO_2 may need to be sequestered using BECCS technology.[21]

Examples

BECCS is broadly considered to be at a stage where it can be deployed on a large scale and has the potential to decarbonise the transport sector.[22] While significant production of ethanol and biodiesel has already taken place in the US in recent decades (using biomass mostly from soy and maize crops), many decarbonisation plans now aim for a serious ramp up of production of liquid transportation fuels.[23]

- Today, there are a handful of small BECCS demonstration projects around the world; in Europe there are projects taking place in the UK (by Drax) and Sweden (by Beccs Sweden).

Strengths

- Bioenergy generation and decreased reliance on imported energy.
- Potential to raise and diversify sources of income in rural areas.

Weaknesses

- Production of bioenergy can lead to competition for land-use with food production, water, fertiliser and the forestry sector (among others).
- Many studies surmise that, should BECCS be deployed on a large scale, the resulting increase in demand for land would threaten food security, food prices and biodiversity[24].
- Significant infrastructure requirements include biomass processing facilities, as well as carbon capture, storage and transportation infrastructure.
- In the case of the EU, the proximity of biomass sources to both power stations and carbon storage sites is not favourable.
- Direct and indirect emissions from land use change.

Scorecard (1-4)

●○○○	Land requirements
●○○○	Infrastructure/materials requirements
●●●○	Energy efficiency
●●○○	Water efficiency
●●●●	Storage permanence

Underground storage and Utilisation

CARBON STORAGE

The permanent or long-duration storage of carbon that is captured with DACCS and BECCS is pivotal to rendering each as a carbon removal technique. As such, CO_2 can be sequestered in suitable underground geological formations. Deep (more than 1,000 metres below the surface) porous rock formations with high permeability are considered ideal for the injection and long-term storage of CO_2 underground.[25] Today, carbon stored in sedimentary rock formations is the most developed form of geological sequestration. This approach is said to increase the volume of CO_2 which can be stored, and the permanence of the sequestration.[26] Much is yet to be done, however, before BECCS and DACCS can be integrated at scale with this sequestration technique – mainly regarding locating these facilities close to suitable geological locations. In terms of permanence, poorly constructed wells are the most pressing challenge to the duration of such storage and are usually the primary cause of leakage.[27]

While the cost of this storage technique is deemed comparatively low, increased capital expenditure costs associated with CO_2 transportation infrastructure (from the site of capture) can be expected.[28] Compared to the US, however, subsurface ownership in Europe typically lies in the hands of governments – a favourable detail for the development of DACCS and BECCS.

CARBON UTILISATION

In addition to storing CO_2 captured via DACCS or BECCS, it can also be used as a feedstock to produce synthetic fuels, plastics, rubbers, chemicals and other long-lasting materials. This process is referred to as carbon utilisation or carbon capture and utilisation (CCU). The European Commission has acknowledged the importance of using recycled CO_2 rather than fossil carbon, especially in the sectors of the economy that will inevitably remain carbon dependent.[29] It is important to underline, however, that the scope for CCU (when combined with either DACCS or BECCS) to serve as a carbon removal remains limited to date and more policy and investment support is required to scale up these practices in the post-2030 economy.

One important issue that must be addressed is the risk of CO_2 being released back into the atmosphere, thus failing to permanently remove carbon.[30] A recent study suggests that only a few of the available CCU technologies emit low amounts of CO_2, such as those used in oil extraction and concrete production. Many others, however, end up emitting more carbon than they capture, especially since CCU processes are incredibly energy intensive.[31] Additionally, the premature stage of most CCU technologies complicate their life cycle assessment, making it difficult to draw conclusions regarding their overall sustainability performance. Finally, when it comes to storage duration, a lot depends on the product itself: CO_2 may stay locked up in building materials for decades but may be stored just a few weeks in short-lived products like jet fuels.[32]

The politics of carbon removal

While the European Commission is aiming to develop harmonised definitions and certification standards, there are undoubtedly major differences when it comes to each country's potential and interest in scaling up carbon removals. Aspects such as the ambition levels of national climate targets, the amount and composition of residual emissions, the size of industry and the agricultural sector in the economy and of course the geographical characteristics will be crucial in defining each of the 27 EU states' paths towards CO_2 removal. New alliances will emerge as political debates start intensifying, with the upcoming CRCM negotiations expected to consolidate the countries' positions on carbon removal solutions.[33]

Technological solutions are likely to be supported by Denmark, the Netherlands, Sweden, and Norway, all of which have a positive outlook on carbon sequestration and are already investing in removal projects. Sweden, in particular, will put its weight behind BECCS due to the country's extensive use of biomass in industry and the power sector. Separately, for a long time Germany was opposed to the transportation and geological storage of carbon, largely because of their negative perception by the public. This, however, could change, as the country is planning to re-evaluate its CCS strategy.[34]

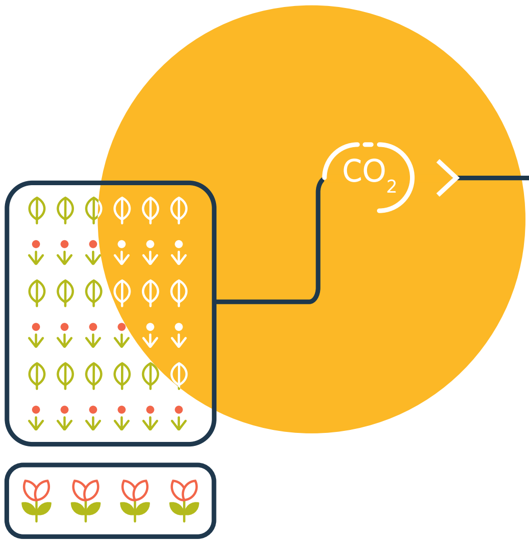
When it comes to agricultural solutions, France is in the lead with strong carbon farming policy, which it will likely try to advance as a blueprint for the European one.[35] Germany, Spain and Sweden are also very interested in advancing nature-based solutions.

Outlook

Certain countries such as Germany, Denmark, Poland, Lithuania, and Latvia may play a strong role in future DACCS and BECCS uptake based on the geological sequestration potential in these countries. The same goes for countries such as Poland, Romania, Ireland, Portugal, Denmark, and the Baltics, regarding nature-based solutions. These countries, due to geographical conditions, as well as the size of the agricultural sector, show a (relatively) high potential for CO_2 removal from the implementation of nature-based solutions.

Overall, the EU has the potential to rapidly upscale and become a leader in carbon removals, provided several conditions are met. One of them is the availability of financial resources, as many of the methods still lack maturity. While the energy crisis will require significant investments in the short-term, investments must continue in climate mitigation solutions, including carbon removals. The second key aspect is creating a robust certification framework. Only a trustworthy and transparent mechanism will ensure the EU-wide participation and the uniform application, both of which are essential for the success of carbon removals in Europe.

As the European Commission's work on the CRCM proposal is ongoing during the publication of this report, the next section will look closely at some of the regulatory challenges it will need to address.



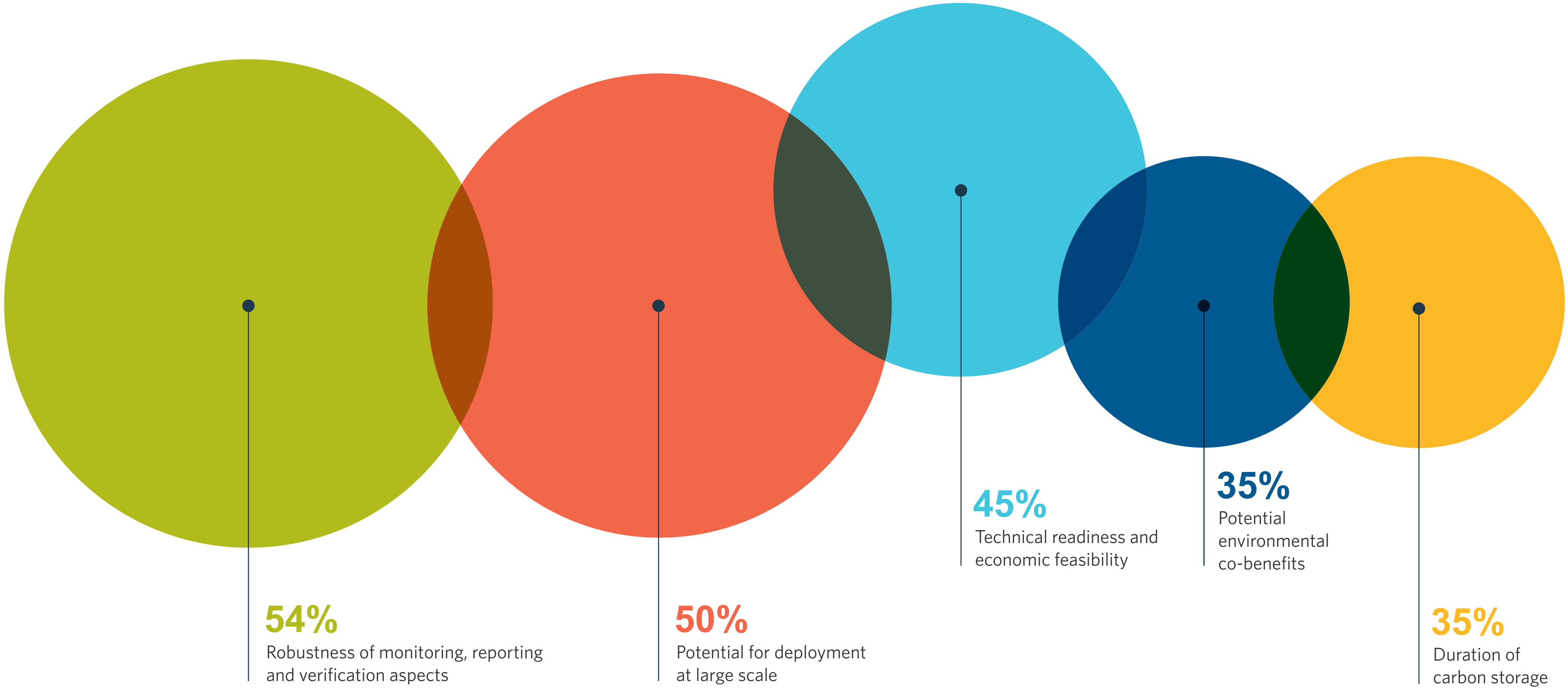
Overall, the EU has the potential to rapidly upscale and become a leader in carbon removals, provided several conditions are met.

Certifying carbon removals – regulatory challenges

What do stakeholders think?

What should be the main criteria defining the types of removals EU should incentivise?

*max 3 answers given by respondent - top 5 answers presented[36]



DEFINITIONS

Precise definitions form the basis for all certification processes and will be especially important for the regulation of carbon removals, especially as there is currently no EU-wide definition of what constitutes a CO_2 removal. A key aspect that needs to be clarified includes the difference between carbon removals and carbon offsets, the mixing of which can potentially lead to greenwashing. Several stakeholders have also called for the differentiation between fossil carbon, carbon captured from the air and biogenic carbon.

Moreover, according to some, defining carbon removals presents an opportunity to break the dichotomy of natural vs technological solutions and rather categorise and certify them based on the removal process (e.g., land-based, ocean-based, chemical, etc.) and estimated storage duration (e.g., decades, centuries, and beyond).[37]

AVAILABILITY AND COSTS

Carbon removal solutions vary substantially when it comes to their readiness to be deployed. The difference lies between nature-based and technological solutions, the latter being less developed and, hence, less available. Moreover, apart from the removal itself, technological solutions require infrastructure for the transportation from the installations to the storage site. Availability also varies within the same category of removals. For instance, some carbon farming practices like peatland restoration are more widely known and have already been deployed across EU countries, in contrast to, for example, the lesser-known conservation tillage. The question then is how to account for the varying degree of availability when developing the CRCM. So far, the Commission's statements seem to indicate that ready-to-deploy practices will somehow be prioritised over others under the certification mechanism.

Naturally, the less available solutions will require more funding to become operational on a large scale. While the sale of credits will be important to support the participants, there is currently no consensus as to which exact funding mechanism(s) will be used to scale up practices.

The Commission has, however, listed several public funding options, including the Common Agricultural Policy (CAP), LIFE Program, Cohesion Policy, and State Aid.[38] For technological solutions, the Innovation Fund – one of the world's largest funding programmes for the demonstration of innovative low-carbon technologies – is envisioned as the main public funding instrument.[39]

Currently, it finances several removal projects, including a BECCS facility at the district heating plant in Stockholm and a new CO_2 storage site in Iceland. The next large-scale call of the Innovation Fund, amounting to €3 billion, will be launched in autumn 2022.

ADDITIONALITY

Despite diverging opinions on how to expand carbon removals, one aspect that most actors seem to agree on is that removal efforts must be additional to emission reductions. Most notably, this is because while removal methods will be scaled up to sequester and store large amounts of CO_2, their capacity will still be limited and lead to carbon accumulation in the atmosphere in absence of ambitious emission reduction policies.[40]

Additionality must also be reflected in the certification of removals. Essentially, this means that a carbon removal credit must be backed by proof that the removal would not have happened otherwise. While proving additionality may be more difficult for some solutions, such as for nature-based removals, disregarding it could lead to net increases in emissions.[41] A common way of approaching additionality in a certification framework is by setting a baseline, namely, a counterfactual against which future removals are compared with the difference being additional.[42] These can be set based on historical data, forecasts based on the business-as-usual or forward-looking scenarios, or each solution's average performance.[43]

To which extent do stakeholders believe the EU certification framework should include the concepts of baselines and additionality?[44]

48%	The CRCM should allow for a variety of baselines and additionality criteria to cater to different types of removals
23%	The CRCM should establish a single methodology to define the baselines and assess additionality
13%	The CRCM should not prescribe definitions for baseline and additionality criteria
16%	Another solution

PERMANENCE OF STORAGE

As illustrated in the carbon removals menu, carbon removal solutions vary significantly regarding the duration of CO_2 storage. These differences can range from several decades to thousands of years, depending on the reservoir. For instance, a land-based removal method like reforestation only stores CO_2 for several decades to centuries, which is significantly less than geological storage that has the potential of storing carbon for thousands of years.[46] This led to the general consensus that short- and long-cycle removals must be valued differently based on their storage duration (with a short-cycle removal having lesser value) and that the resulting credits should not be fungible.[47]

Different solutions also pose different risks of removals getting reversed, especially regarding land-based removals. This calls for the inclusion of risk management instruments in the scheme, many of which are already used in voluntary schemes. For instance, participants may be required to sign up to long-term monitoring plans or long crediting periods, which aims to provide security for buyers.[48] Finally, a liability clause may oblige certain participants to offset any future reversals. While the Commission has multiple risk management options at its disposal, many agree that the risk of reversals should also be reflected in the credit value.

How should the CRCM approach the risk of intentional/unintentional reversal of CO_2 removals?[49]

43%
Methods with a risk of reversal to be discounted or requiring a share of the removals to be stored in a buffer account

37%
Commitment to multi-year monitoring plans at the outset of the certification procedure

35%
Issuing certificates with specific durations that can be renewed

34%
Encouraging/requiring removal providers to set up insurance systems

SUSTAINABILITY

Although carbon removal practices are conceived to address climate change mitigation specifically, often these same actions deliver other environmental, climate adaptation and socio-economic co-benefits. This is particularly true in the case of nature-based solutions and carbon farming, which might significantly contribute to broader environmental objectives, such as biodiversity, soil health, and water quality. As such, co-benefits are often accounted for and rewarded in the context of the existing certification schemes and can be a critical selling point for participants.[50]

Some of the most common benefits consist of public goods such as biodiversity conservation, prevention of soil erosion, and increased soil fertility and micro-climate benefits, as well as benefits for farmers such as cost savings, increased soil productivity, and additional and diversified income streams resulting from the rewarding scheme itself. The co-benefits can make carbon farming more attractive and justify greater public funding.

At the same time, one of the reasons behind opposition to carbon removals is their potential for environmental harm, which can result from intentional behaviour, such as fraudulent sequestration claims, as well as from incorrect measurements, reversals and other inadvertent practices.[51] An example is the potential negative biodiversity or adaptation impacts associated with implementing agroforestry measures that are not locally appropriate. The EU's lack of experience with some carbon removal solutions further deepens these concerns. It is important for the CRCM to maximise the co-benefits of removals while minimising these negative externalities.[53] Therefore, it can require methodologies to identify and target (several) co-benefits, which will need to be quantified through a robust Measurement, Reporting and Verification (MRV) framework and which can be listed on the removal certificate.

SOCIAL COSTS

For nature-based carbon removal solutions, creating a system where carbon farming practices would be more profitable than conventional agricultural management is an acute challenge. Furthermore, there is a need to ensure the economic feasibility and profitability of these practices for farmers, making sure that farmers can manage and recover the up-front investment costs of setting up and implementing carbon farming activities. The allocation and management of financial risks linked to lack of results due to insufficient (detectable measurable) amounts of carbon sequestered - are also critical to ensure uptake. Result-based mechanisms[54] and the price uncertainty of exchange-based markets can in fact pose risks for farmers, discouraging the upscaling of carbon farming.

DIGITALISATION OF MRV

To effectively assess the quality and validity of carbon removal solutions, a sufficient pool of accurate, standardised, and accessible data will be needed. Challenges which policymakers are expected to address in this regard range from those relatively easy to tackle, such as ensuring an ample amount of data points, to ones that require more complex solutions, such as standardisation of datasets. The latter, for example, will be a key factor in ensuring sufficient data interoperability. This will be required to keep track of overall alignment between carbon removal technologies and other elements of the European Green Deal. Interoperability of MRV data will also be the main prerequisite for integrating carbon removals in the upcoming Common European Green Deal Data Space, which is a part of the EU's data strategy focusing on operationalising data potential to support the Green Deal objectives.[55]

Current EU legislation provides little to no solutions to tackle the abovementioned challenges. Under the revised LULUCF[56], Member States would need to upgrade their geographically explicit datasets relating to carbon baselines so they can provide an overview of countries' carbon emission sources. Creating an environment conducive to a large-scale rollout of carbon removal solutions will, however, require this obligation to be matched with a comprehensive data collection and analysis mechanism related to the EU's CCS capacities. Such a mechanism is yet to be developed.

While lacking a standardised framework for MRV data, the EU has made its first attempts to map parts of its carbon capture and storage capacity. Launched in 2020, the EU's Storage Potential Database ('CO_2StoP')[57] collects data on geological storage sites from 26 different EU Member States. Importantly, the 'CO_2StoP' project has resulted in the development of tools that allow for the visualisation of storage potential and the computation of storage capacities and injection rates. These are expected to serve as a basis for the development of a comprehensive so-called 'European CO_2 Storage Atlas' in the coming years.

What does the European Parliament think?

While the European Commission is preparing the CRCM proposal, the European Parliament has launched an own-initiative procedure (INI), the outcomes of which will feed into the Commission's work.

ENVIRONMENT (ENVI) COMMITTEE

- Stresses the need for a market-based approach to carbon farming.
- Questions the role of Common Agricultural Policy (CAP) as the appropriate financing instrument.
- Advises to gather more data prior to storing CO_2 underground at a large scale.

AGRICULTURE (AGRI) COMMITTEE

- Disagrees on how to finance carbon farming (public vs private funding).
- Emphasises the importance of protecting small farmers.
- Proposes to expand the scope to include other GHG emissions.

INDUSTRY (ITRE) COMMITTEE

- Acknowledges the potential of technological solutions, questions the durability of natural sinks.
- Suggests differentiating between solutions based on the cycle length (short vs long-cycle removals).
- Stresses the role of EU funds.

- Welcome the Commission's initiative.
- Recognise the priority of emission reductions over removals.
- Call for a robust, transparent, and credible framework.

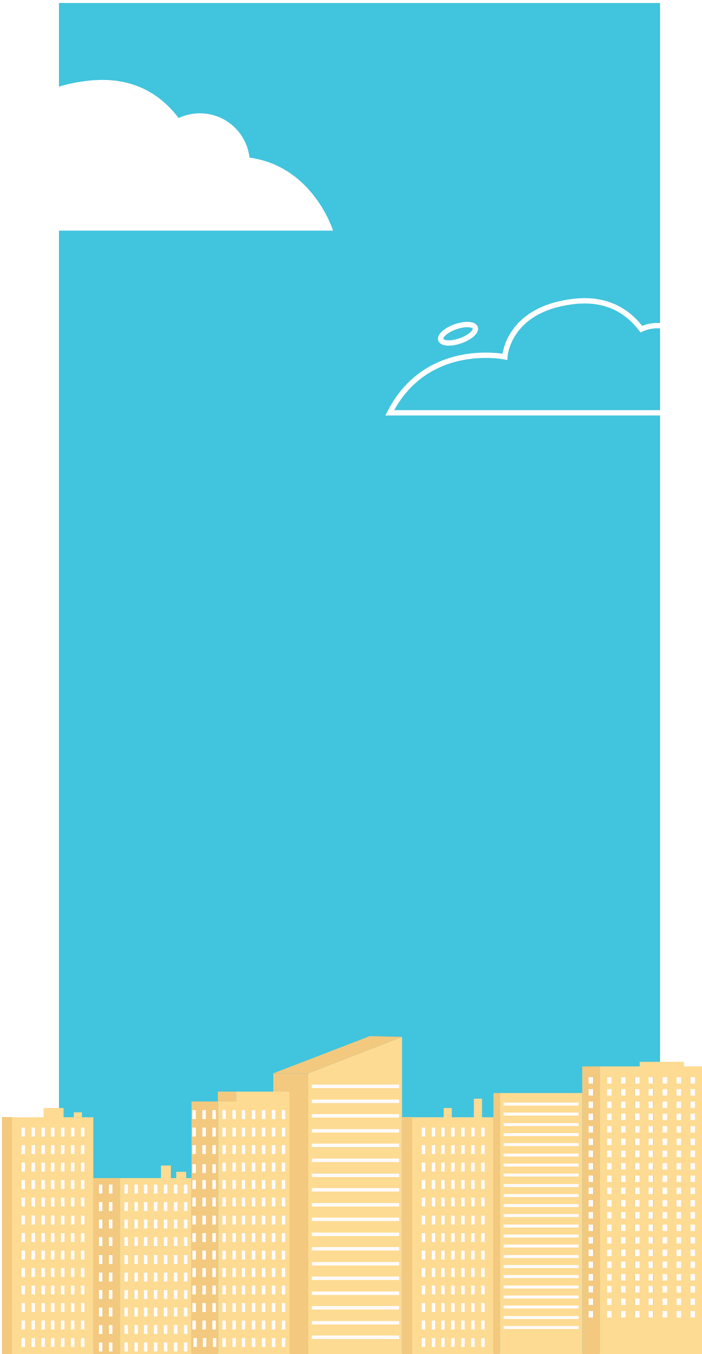
The role of international financial actors

The trading of carbon credits has existed for several years, with rapid growth in recent years, reaching EUR 760 billion in 2021.[58] However, these markets remain in a largely emerging state for the moment, with market mechanisms still subject to important changes.

VOLUNTARY CARBON CREDITS

Voluntary carbon credits (VCCs) are either sold directly on a primary market – i.e., purchased directly from the issuer of the credit – or traded on secondary markets through voluntary carbon credit spot (credit exchanged at moment of purchase) or derivatives contracts.[59]
A derivative is a type of contract between two counterparties based on an underlying asset, in this case a carbon credit, that is predominantly designed to reduce, or 'hedge' specific risks, such as future price fluctuations of that asset. Common types of derivatives contracts include:

- Futures, where the carbon credit will be transferred from the seller to the buyer on a predetermined future date in exchange for a predetermined price.
- Options, where the holder of the option has the right to buy or sell an underlying asset (in this case the VCC) at a predetermined price, within a specific period.



VOLUNTARY CARBON MARKETS

Currently, voluntary carbon markets (VCMs) are not directly regulated, both in terms of the standards to which credits should adhere, nor the tracking/registration of allowances. Various issuing bodies and registries exist globally, each with their own respective sets of rules[60], leading to notable divergences in terms of the verification, counting and transfer of these credits.

Important advances have been made at the international level, with Article 6 of the Paris Agreement outlining the rules for trading carbon credits and allowances between signatory countries, setting out a preliminary framework for the counting and transfer of credits, which could also underpin voluntary carbon trading on a global scale.[61]

Article 6 permits voluntary international cooperation to help governments meet their nationally determined contributions (NDCs). Those who exceed their emissions reduction targets, thus going beyond their NDC, can on a voluntary basis sell their excess allowances to those countries who underperformed. Where a country sells its emissions reduction to another, this cannot be used to count towards its own NDC.

However, despite these advances, there is still no overarching regulatory framework in place, and the current situation gives rise to several challenges in terms of the development of VCMs, including the following:

- Different standards for what a credit constitutes, such as eligible underlying activities that can produce a carbon credit, how a metric ton of GHG emissions removals from the atmosphere is calculated, and how long the carbon needs to be stored, or the permanence of a removal. There is also a need for a common understanding of the required additionality.
- Concerns over the quality of credits in the absence of uniform standards, verification systems and oversight. This can also lead to excessive creation, or 'issuing' of credits.
- Fragmentation and complexity in the market, both in terms of the venues and trading mechanisms used as well as the lack of standardisation in terms of credit features.
- Lack of market liquidity and accessibility to credits, and fragmentation in the market can pose barriers to a stable supply and demand for credits, making it more difficult to buy and sell them.
- Notable divergences in pricing resulting from the abovementioned problems, which further contributes to low levels of market liquidity and could undermine investor trust.

Policymakers can help address many of these issues, such as through the upcoming CRCM proposal.[62] However, the private sector, and in particular the financial services sector has a key role to play in ensuring that voluntary carbon markets are active, liquid, and accessible, providing the infrastructure for trading of the credits, and a level of price stability through continued levels of supply and demand, or 'liquidity'.

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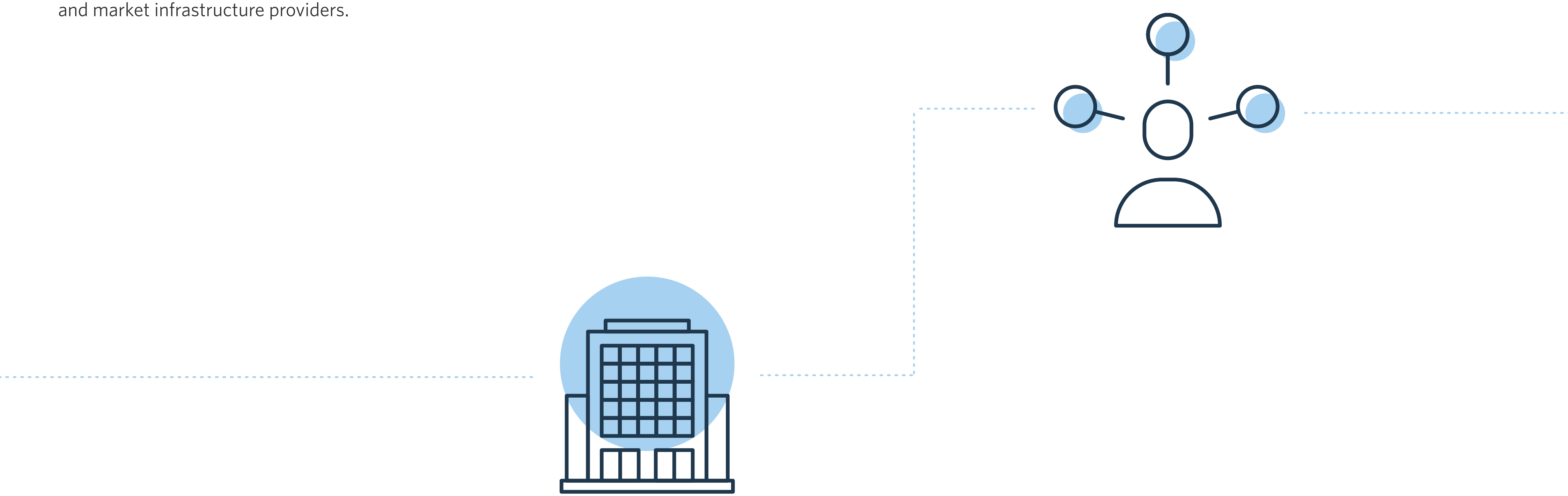
CURRENT INITIATIVES IN THE FINANCIAL SERVICES SECTOR

Several VCM initiatives have already been launched at international level to tackle the abovementioned challenges. On 8 July 2021, the International Institute of Finance (IIF) launched a Taskforce on Scaling Voluntary Carbon Markets (TSVCM)[63] to recommend actions for tackling the current challenges that voluntary carbon markets face. The Taskforce has more than 50 members, from standard setters, and buyers and sellers of carbon credits, to financial sector actors and market infrastructure providers.

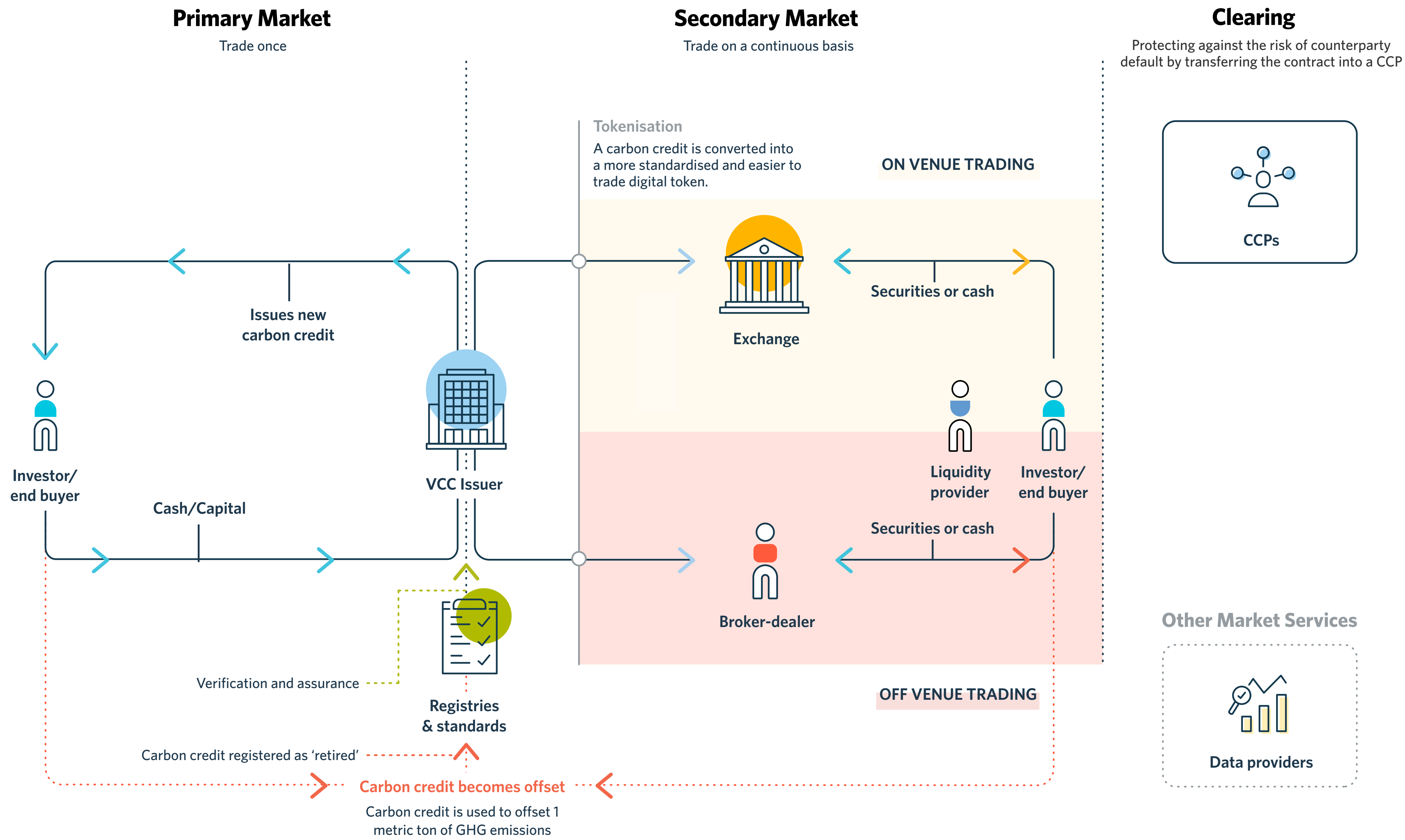
Moreover, Project Carbon is an initiative launched in July 2021 by a group of global banks spanning four continents.[64] The project entails a pilot voluntary carbon marketplace which aims to support the development of a liquid and transparent market, as well as the trading of high-quality credits, in line with the objectives of the TSVCM.

While each initiative has its own specificities, we can broadly identify the same actors who each perform their respective role, as outlined in the visual on the next page (legenda on page 24).



The role of financial actors in voluntary carbon markets*

★ Figures explained in next page



FINANCIAL ACTORS & MARKET INFRASTRUCTURE

CENTRAL CLEARING COUNTERPARTY (CCP)

A CCP is an institution which protects against the risk that one of two parties (for example party A and party B) to a transaction is unable to follow through, or 'defaults' on its agreed obligation to buy or sell the VCC. It acts as an intermediary between those two parties by taking over the responsibility of each towards the other and thereby eliminating, or 'clearing' the risk of 'default' by the other party. In practice, this means that CCP will cover the losses to party A, if party B is unable to pay for the VCC that it agreed to buy, enhancing the level of confidence between the trading parties.

EXCHANGE

An exchange is a trading venue or marketplace where buyers and sellers can buy or sell their VCCs. They facilitate the trading of securities on a continuous basis by matching buy and sell orders from market participants. Exchanges could facilitate trading of VCCs by grouping similar credits with common features. They could also provide a continuously transparent price, that depends on the demand and supply of credits at that moment.

BROKER-DEALER

As an alternative to the marketplace, sellers and buyers of VCCs could buy these through broker-dealers, who will execute their order where they function as broker or they can buy from/sell to these directly, where these act as dealers of products they own.

TOKENISATION

The larger the difference between products, the more difficult it is to trade them. Tokenisation can help address this problem by turning the VCCs into uniform, comparable, and traceable units, called tokens. It thereby makes them easier to price and trade and therefore more accessible to buyers. Tokenisation requires a framework to ensure sufficient transparency for buyers to support projects they intended to, and to avoid others.

LIQUIDITY PROVIDER

A stable, continuous supply and demand ensures that market participants can rely on the ability to buy and sell VCCs whenever they want, at a relatively predictable price. This continued stability is predominantly provided by parties that buy and sell orders in large volumes on a trading venue, or 'liquidity providers'.

INVESTOR/ END BUYER

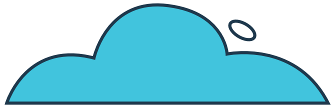
VCCs can be bought with different objectives. They can be seen as an investment for those that believe they will increase in value over time. However, at the end of the day, they are meant to be bought by corporates (or individuals) that want to compensate, or 'offset' their emissions, or that want to contribute financially towards removing GHG emissions. Once a VCC is used to compensate for a metric ton of GHG emissions, it becomes a 'carbon offset'. From that moment, the VCC is no longer meant to be traded.

DATA PROVIDERS

Buyers and sellers of VCCs require data on the price and volumes traded in VCCs. This provides them with the confidence to enter into informed transactions and to assess the risks involved.

REGISTRIES & STANDARDS

These play a central role in VCMs as they provide legitimacy to a VCC and keep an overview of VCCs in the market. They constitute both the beginning and end of a VCC life cycle. When a credit is created, or 'issued' from a project, this is registered with a carbon offset registry. In addition to the credits issued, the registry also tracks ownership of the VCCs, and "retires" the credit as soon as it is used to offset GHG emissions.

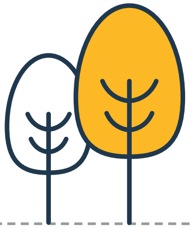


07 November 2022
European Parliament INI report on Sustainable Carbon Cycles

30 November 2022
European Commission CRCM proposal publication

Throughout 2023
CRCM negotiations in the Parliament and the Council

2024
Adoption of the CRCM



2024 - 2030
Adoption of delegated acts

2030
Start of the mandatory carbon removals certification

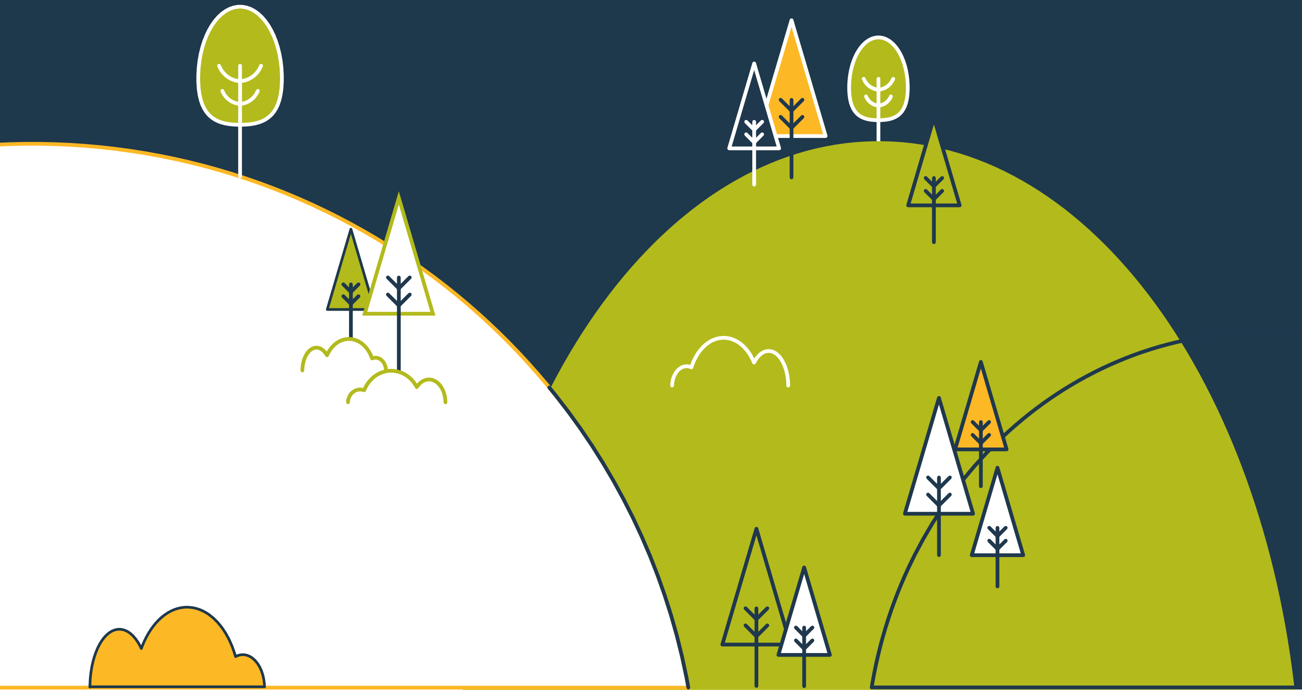
*This is an indicative timeline

Conclusion

Carbon removal solutions will play an important role in climate mitigation, enabling the EU Member States and other countries to reach and maintain their carbon neutrality pledges. For now, as the regulatory work on scaling up carbon removals is still at an early stage, we hope that this handbook will provide you with all the necessary information to understand and engage in the debate around the CRCM.

FH 2050 – Your public affairs compass for the sustainability and climate agenda

Climate change and sustainability have long been significant drivers of European public policy. Now through the EU Green Deal, climate neutrality targets are mainstreamed into EU policies and initiatives. The COVID-19 and energy crises has only served to catalyse Europe's ambition and focus minds on the green recovery. Consumer awareness, global leadership and environmental and social resilience are examples of the drivers that will impact change. For all organisations, across all sectors, managing the regulatory and political environment, being part of the conversation and transforming ambition into action will be an essential part of effective public affairs and communications engagement in the current environment. Our FH 2050 practice combines our deeply embedded sectoral expertise across policy issues like energy, transport, finance, technology, environment and chemicals, with the strength of our integrated communications and reputation management practice to help organisations navigate the reputational, financial and legislative impacts associated with the transition to climate neutrality. Do not hesitate to get in touch with us to discuss how we can provide bespoke support to your organisation on the upcoming carbon removals certification proposal or other sustainability policies.



ABOUT FH STUDIO

As part of FleishmanHillard's Reputation Team, BRU Studio works across the Finance and IPA Teams and can lend its creative expertise to any subject or issue.

Working with with a broad spectrum of colleagues and clients: from start-ups to global brands, interns to CEOs, and anything in between.

The Studio also helps bring in new business, supporting on creative strategy through to ideation and delivering pitch-winning work and ideas.

If we can't do it ourselves, we'll use our global network (our little black book) and find someone who can.

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