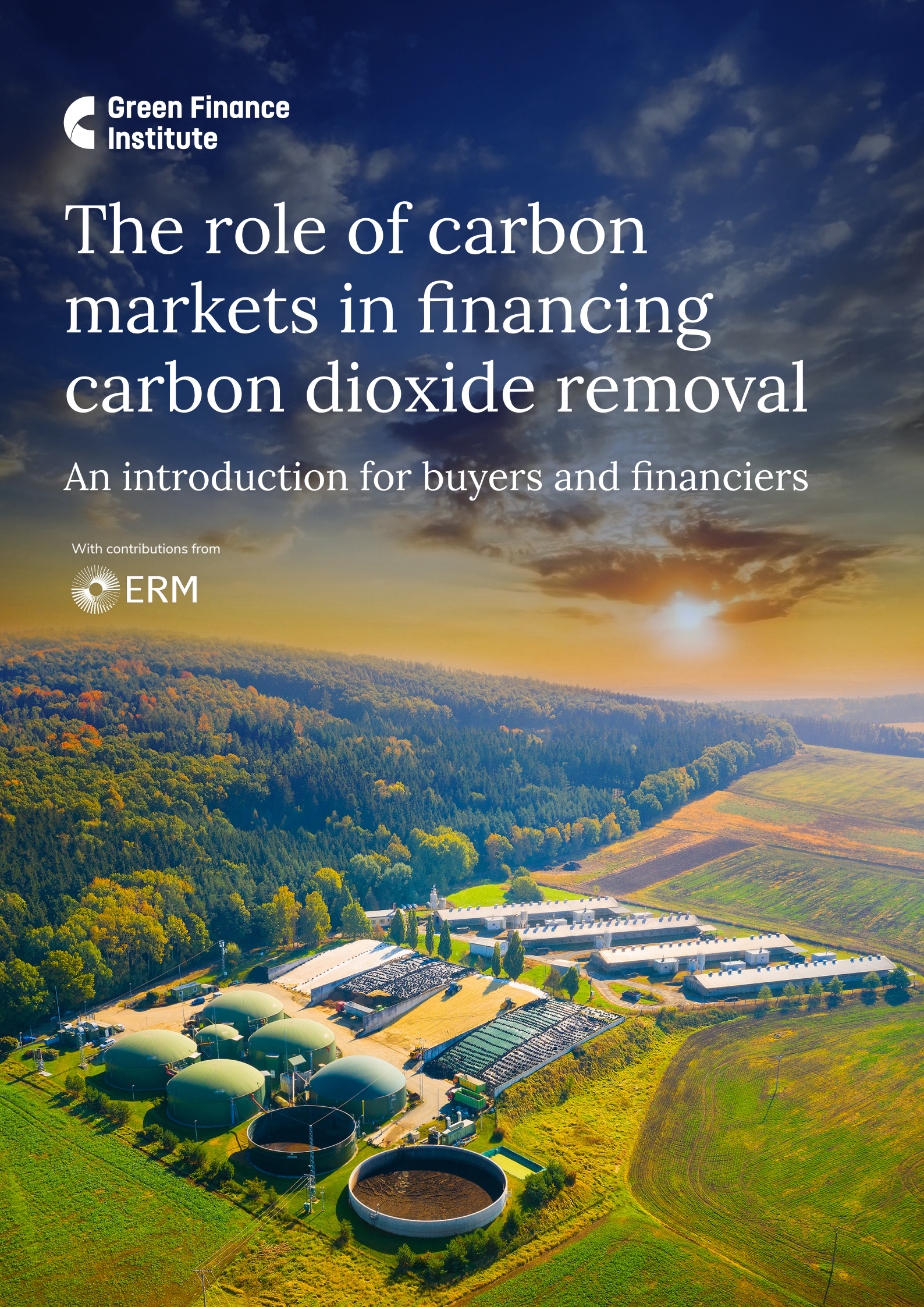
Green Finance Institute

The role of carbon markets in financing carbon dioxide removal

An introduction for buyers and financiers

With contributions from

ERM



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Disclaimer

Contents

Acronyms and abbreviations

Acronym	Description
BBB	British Business Bank
BECCS	Bioenergy with Carbon Capture and Storage
CCfD	Carbon Contracts for Difference
CCP	Core Carbon Principles
CDR	Carbon Dioxide Removal
CO_2e	CO_2 equivalent
DAC	Direct Air Capture
DACCS	Direct Air Carbon Capture and Storage
ERG	Environmental Reporting Guidelines
ERW	Enhanced Rock Weathering
ESG	Environmental, Social and Governance
ETS	Emissions Trading System
EU	European Union
GHG	Greenhouse Gas
HFC	Hydrofluorocarbon
ICROA	International Carbon Reduction and Offset Alliance
ICVCM	Integrity Council for the Voluntary Carbon Market
MRV	Measurement, Reporting, and Verification
MOU	Memorandum of Understanding
SBTi	Science Based Targets initiative
UK ETS	United Kingdom Emissions Trading System
UNFCCC	United Nations Framework Convention on Climate Change
VCM	Voluntary Carbon Market
VCMI	Voluntary Carbon Market Integrity Initiative
VCNM	Voluntary Carbon and Nature Market
VVB	Validation and Verification Body

1. Introduction

Climate change poses a critical threat to ecosystems, economies, and communities, primarily driven by human-induced CO_2 emissions from fossil fuels, deforestation, and industry. Rising global temperatures, extreme weather, and biodiversity loss are already evident and worsening. Urgent action is needed to reduce emissions and avoid severe impacts on health, food security, and livelihoods, particularly for vulnerable populations.

Whilst reducing emissions is the primary focus, it is unlikely to be sufficient on its own if we are to achieve the goal of limiting the rise of global temperatures to well below 2°C above pre-industrial levels[1]. Carbon dioxide removal (CDR), a process that removes carbon from the atmosphere and stores it for the long term, will be needed under all foreseeable pathways to neutralise unabated (residual) emissions and reach our climate goals[2].

CDR can be achieved through nature-based methods via photosynthesis (e.g. reforestation or peatland restoration) or engineered approaches such as direct air carbon capture and storage (DACCS) or enhanced rock weathering (ERW). It is estimated that 7-9 billion tonnes of CO_2 per year will need to be removed by mid-century if the world is to meet the Paris Agreement goal, yet only 2 billion tonnes of removal has been achieved in total since 2016, primarily from tree planting, although such projects may not offer the long-term storage required due to the risk of reversal from burning or death of trees (non-permanent storage)[3].

This paper explores the carbon markets as a lever to scale investment in high quality, durable, CDR methods. It summarises the latest innovations in financing CDR via carbon markets and investment options for private sector finance, as well as highlighting the critical role policymakers can play in providing long term confidence for investors.

2. A Carbon Market Overview

Carbon markets are based on traded units, with each unit equivalent to the emission of one tonne of carbon dioxide (CO_2). This unit may be a simple 'allowance' to emit, for example in a compliance scheme such as the UK or EU emissions trading system (ETS), but it can also represent an assumed amount of CO_2 that has been avoided or removed from the atmosphere. Once verified and certified, this unit of avoidance or removal, or 'carbon credit', can be traded and eventually retired as compensation for unabated emissions.

The last two decades have seen the widespread growth of, and increasing overlap between, the various carbon market mechanisms. These operate at an international level between countries (under the UN Paris Agreement Article 6), within national or regional compliance regimes (mainly ETS or taxes) and via the range of independent registries that form the Voluntary Carbon Market (VCM). It is the VCM that is primarily used by private entities to source carbon credits as mitigation for their unabated emissions and as a source of CDR to achieve their net zero goals.

This paper focuses primarily on drivers and evolving **opportunities for investment in the VCM**.

Types of Carbon Credit

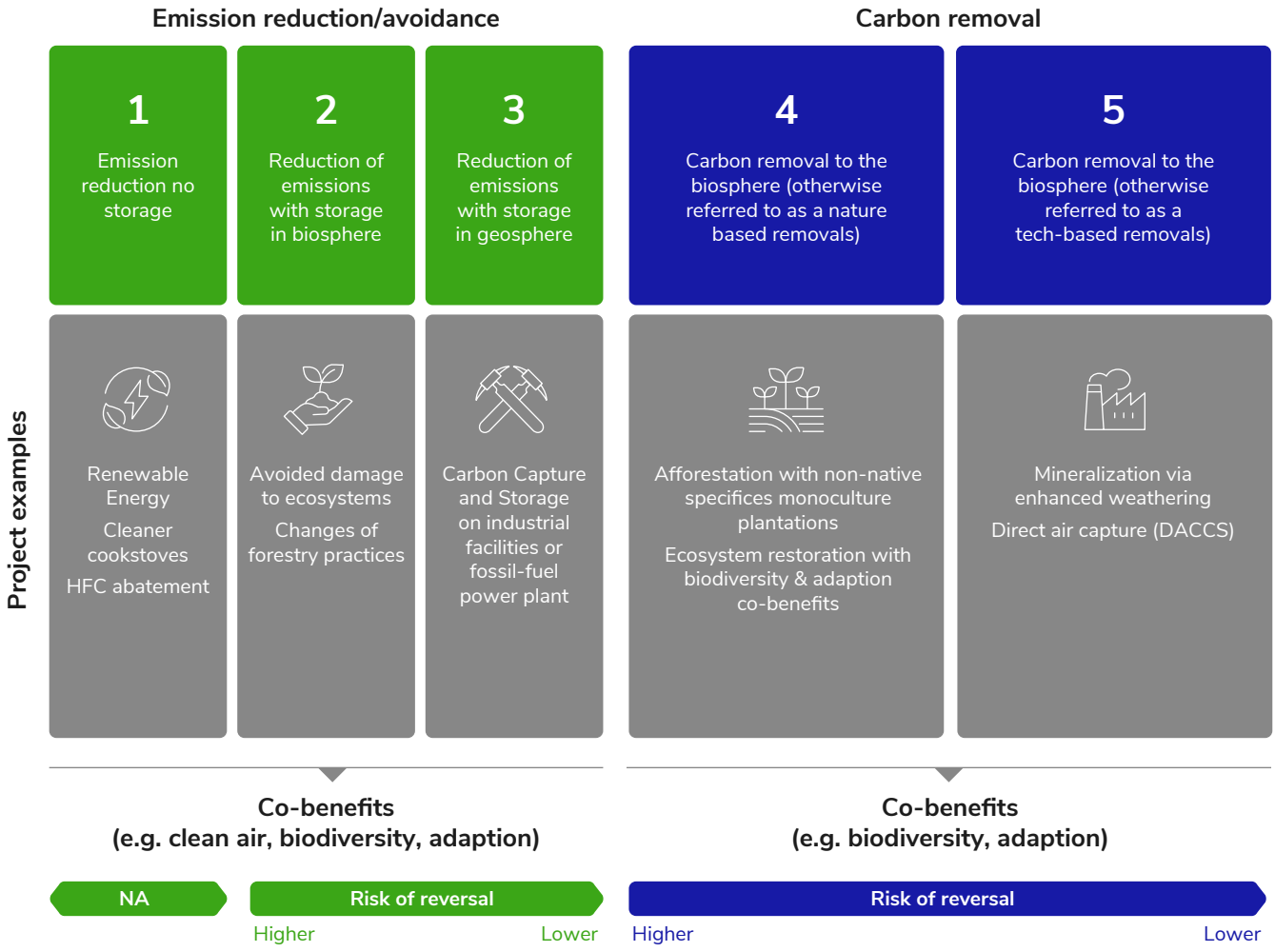

Figure 1: Carbon Credits Categories based on the Oxford Principles[4]

How is a Carbon Credit Created?

Carbon credits are created from the difference in emissions/removals compared with an assumed counterfactual baseline. The mechanism operates via established standards bodies (e.g. Verra, Gold Standard, Isometric or Puro) and the 'rules' for generation and quantification of credits are set out in approved methodologies. Independent auditors – known as validation and verification bodies (VVBs) - validate that a carbon project conforms with the Standard and verify the tonnes of CO_2e that have been avoided or removed. The credits, and their transactions, are tracked within transparent registries.

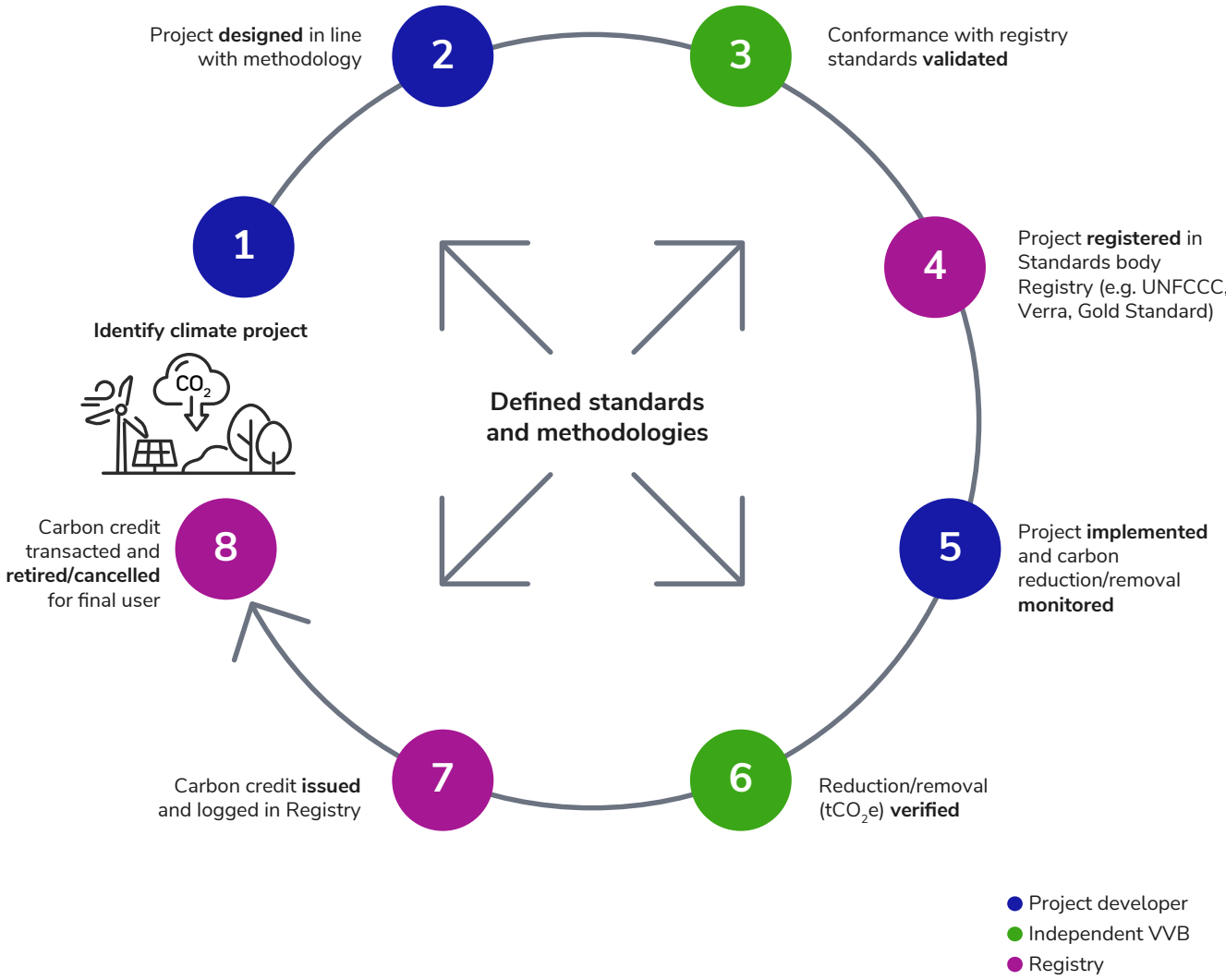

Figure 2: Overview of Process to create a Carbon Credit

CDR Market Landscape

To date, the VCM has been the primary market for carbon credits. Over $43 billion has been raised or committed globally for carbon credit activities since 2021[5], with more than half of that directed toward **nature-based removal projects** such as reforestation and avoided deforestation. The primary consumers of credits are organisations with ambitious net zero goals and a strong corporate mandate to compensate for emissions.

According to the analysis[6]:

- At the end of 2024 **more than 6,200 carbon projects were registered** across the 12 largest international crediting registries.
- These projects issued **305 $MtCO_2e$ of credits**, bringing the total to over 2.1 billion credits issued since the Paris Agreement was signed in 2016.
- In 2024 alone, **180 $MtCO_2e$[7] of these credits were 'retired'[8],** typically by corporations seeking to mitigate their annual emissions on a voluntary basis.
- Only about **9% of retired credits in 2024 were sourced from CDR actions**, while the remaining 91% were from emission avoidance activities.

Carbon credits have largely been excluded from cap-and-trade compliance regimes other than in several regional systems where their use is tightly controlled, such as in Australia and California. This is changing, however, with increasing acceptance that a range of mechanisms will be needed to meet national climate commitments. Both EU and UK Emissions Trading Systems (EU/UK ETS) are actively exploring how CDR could be integrated into the market from 2028 or the early 2030s.

At a global level, adoption of the United Nations Framework Convention on Climate Change (UNFCCC) "Article 6" provides a mechanism to standardise the quality of credits and facilitate the transfer of credits between countries. Article 6 is still in the design process, but once adopted it is likely to incentivise international carbon credit trading within domestic compliance programs. As multiple jurisdictions begin allowing the use of carbon credits within defined limits, this will send a strong and credible demand signal to the market for CDR—illustrated by early examples such as Japan's GX League[9].

In the medium to long-term, the integration of carbon credits within national and international compliance mechanisms will provide a much-needed boost to the scale-up of CDR technologies, as a predictable and enforceable demand mechanism. Widespread adoption is unlikely to be in place before the 2030s however, therefore the VCM will play a critical role in ensuring CDR technologies can scale in the intervening years. Whilst public sector support for CDR is emerging through subsidies and targeted incentives, private sector investment remains critical to accelerating progress and growth for CDR technologies, which must go through rapid cycles of innovation, cost reduction and deployment during the 2020s and 2030s to become viable at global scale by the 2040s.

(For more details on the policy landscape, please refer to the GFI paper The Investment Readiness of CDR in the UK, A Preliminary Assessment)

Market Integrity

Carbon credits have faced criticism over their perceived lack of integrity[10]. Accusations have centred largely on whether the credits represent real climate benefit- not just 'business as usual' - as well as adverse impacts on local communities. The challenges vary by project type, with nature-based projects in particular facing criticism that the climate benefit is temporary (for example due to fire risk) or that protection in one place leads to carbon leakage, and enhanced emissions elsewhere. These high-profile criticisms reduced market confidence and led to a renewed focus on what 'high integrity' really means.

Both Article 6 of the Paris Agreement and the Integrity Council for the Voluntary Carbon Market (ICVCM) are set to play pivotal and complementary roles in addressing persistent challenges in the Voluntary Carbon Market, particularly around reputational risk, market complexity, and price uncertainty. Article 6 introduces internationally recognised mechanisms that enable countries and private entities to cooperate on emissions reductions by using transferable carbon credits. These mechanisms – notably Article 6.2 (bilateral agreements) and Article 6.4 (a centralised UN-supervised crediting mechanism) – include robust, transparent accounting rules that ensure credits are not double counted when they are sold internationally (corresponding adjustments) (UNFCCC, 2021). This regulatory backbone enhances the legitimacy and integrity of credits used by corporates, thereby helping them mitigate reputational risks and confidently make net-zero claims.[11]

Complementing Article 6, the ICVCM's Core Carbon Principles (CCPs) offer a quality benchmark for credits across the broader VCM, independent of jurisdictional alignment under Article 6. The ICVCM's Assessment Framework approves programmes and methodologies that meet stringent criteria on environmental integrity, additionality, permanence, and sustainable development (ICVCM, 2023). When integrated with Article 6 rules, ICVCM-eligible credits can serve as a trusted supply source for corporates seeking to align with the Paris Agreement, regardless of whether they are transacting in compliance or voluntary settings. Together, Article 6 and the ICVCM reduce market complexity by harmonising quality signals across fragmented crediting standards and improving price certainty by boosting market confidence and enabling long-term contracting and liquidity. A potential challenge may come from delays in the ability to verify projects under the ICVCM assessment framework, and a spike in demand for credits with the CCP accredited label, driving up prices and reducing activity in the market. It is important that the quality benchmark provided by the ICVCM is reflected as a threshold in other international, regional and national standards to facilitate the penetration of high-quality projects on the market.[12]

Governance of engineered CDRs

To date, engineered CDR has received less criticism than other types of carbon credit, largely due to a higher level of confidence that the removed carbon will be stored for a very long time (i.e. the credit delivers more durable, or permanent, carbon removal). Also, because engineered removals carry a relatively high price, there is less risk that a company will be accused of avoiding action to reduce its own operational emissions.

The first methodologies for quantifying and crediting engineered CDR were launched[13] in 2019, but they have since proliferated, reaching 57 methodologies[14] across the VCM by March 2025. Most engineered CDR projects are registered under carbon crediting programs that are recognised by international governance frameworks such as International Carbon Reduction and Offset Alliance (ICROA) or the ICVCM. As of July 2025, none of the engineered CDR methodologies are CCP-approved, but they are expected to secure this status soon, once ICVCM completes its assessments.

A small number of CDR methodologies are established by CDR developers themselves as an interim solution to allow them to serve first mover buyers. These methodologies are generally for innovative technologies that are not yet adopted by the established standards. Although they do not currently have the same safeguards as recognised standards, such "self-made" methodologies have the potential to provide estimates for the carbon removal potential of early-stage projects and help start-ups demonstrate their technologies and bring the projects and methodologies into the mainstream market.

Recent Market Growth

Whilst the environment for financing CDR is very difficult, MSCI estimates[15] that between 2021 and 2024 around 70% ($29.6 billion) of capital commitments in the carbon market were directed toward carbon removal projects, spanning both nature based ($19.6 billion) and engineered solutions ($10.1 billion). Notably, the capital committed to engineered removals, such as biochar, bioenergy with carbon capture and storage (BECCS) and DACCS, nearly doubled in the first three quarters of 2024, rising from $2.6 billion in 2023 to $4.7 billion. Figure 3, which shows capital raises and commitments by project type, illustrates this shift.[16] [17] Technologies such as DACCS and BECCS typically need more up-front capital due to significant infrastructure and storage requirements, whilst nature-based removal options such as mangrove and peatland sequestration incur lower costs, driven by labour, land, and opportunity costs. In parallel, the market for captured CO_2 for utilisation as industrial feedstock or sustainable aviation fuel[18] is growing – whilst this offers no permanent removal, such uses serve to avoid the continued addition of CO_2 to the atmosphere from fossil sources.

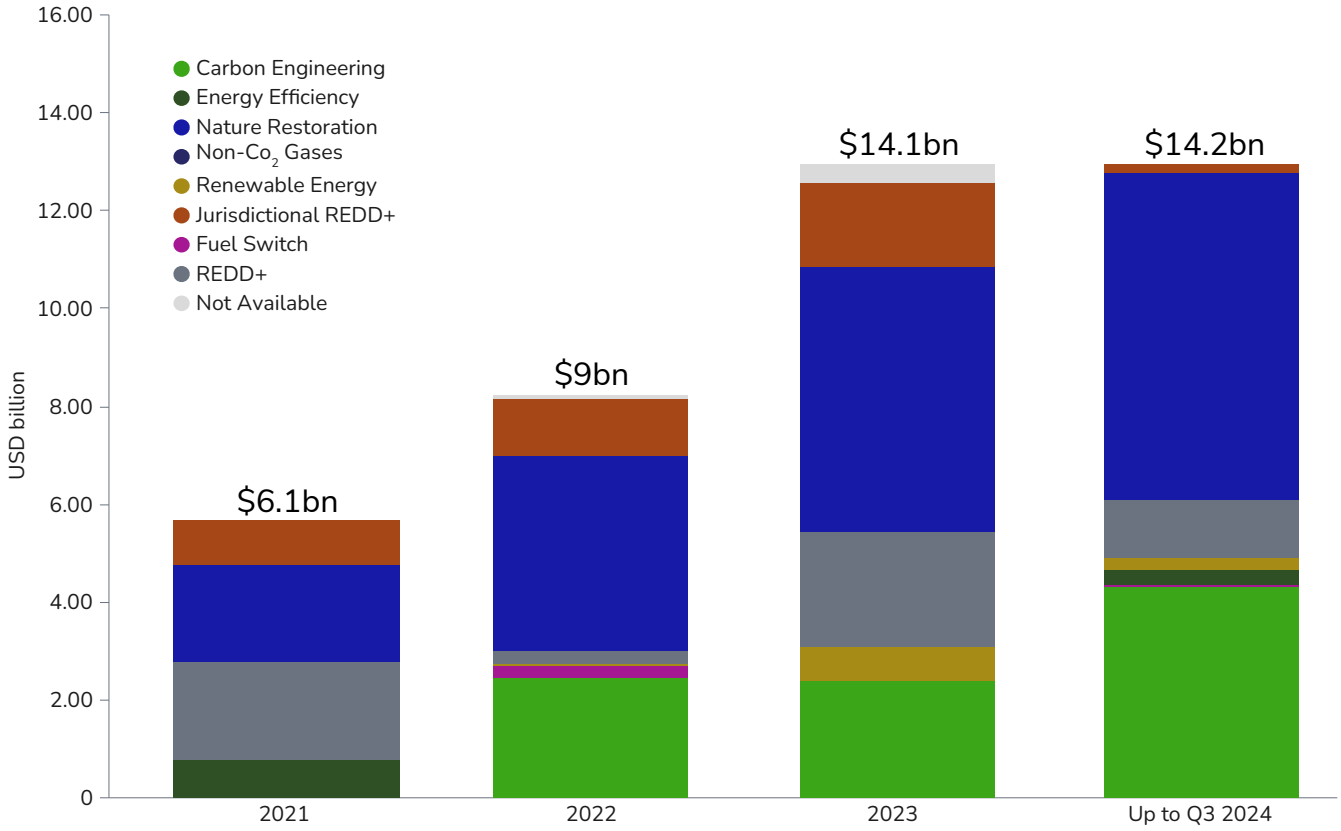

Figure 3: Capital Raises and Commitments for Carbon Projects by Project Type as of 30th September, 2024[19]

The growing investment in engineered solutions reflects an increasing appetite for, and confidence in, more durable, high-integrity carbon removals. Although fewer agreements were signed in 2024 compared to 2023, the average deal size has increased, suggesting a more targeted approach to purchasing credits. Much of this growth has been driven by large, forward-purchase commitments from major corporates, signalling strong buyer conviction and long-term support for removal-focused projects.

U.S.-based corporate buyers accounted for c.64% of global demand for engineered carbon removals as of March 2025, with Microsoft and Frontier (a coalition of CDR buyers) alone accounting for around 58% of cumulative demand in terms of volume purchased. Microsoft have recently entered into a multiyear agreement for 2.95 million tonnes starting in 2029 for a Waste to Energy carbon capture storage retrofit.[20,21] This concentration underscores the pivotal role of leading corporations in shaping the early dynamics of the engineered CDR market and providing critical demand signals needed to scale emerging technologies. Figure 4 illustrates this demand breakdown by geography and buyer, highlighting the outsized influence of a few key players in catalysing early market activity.

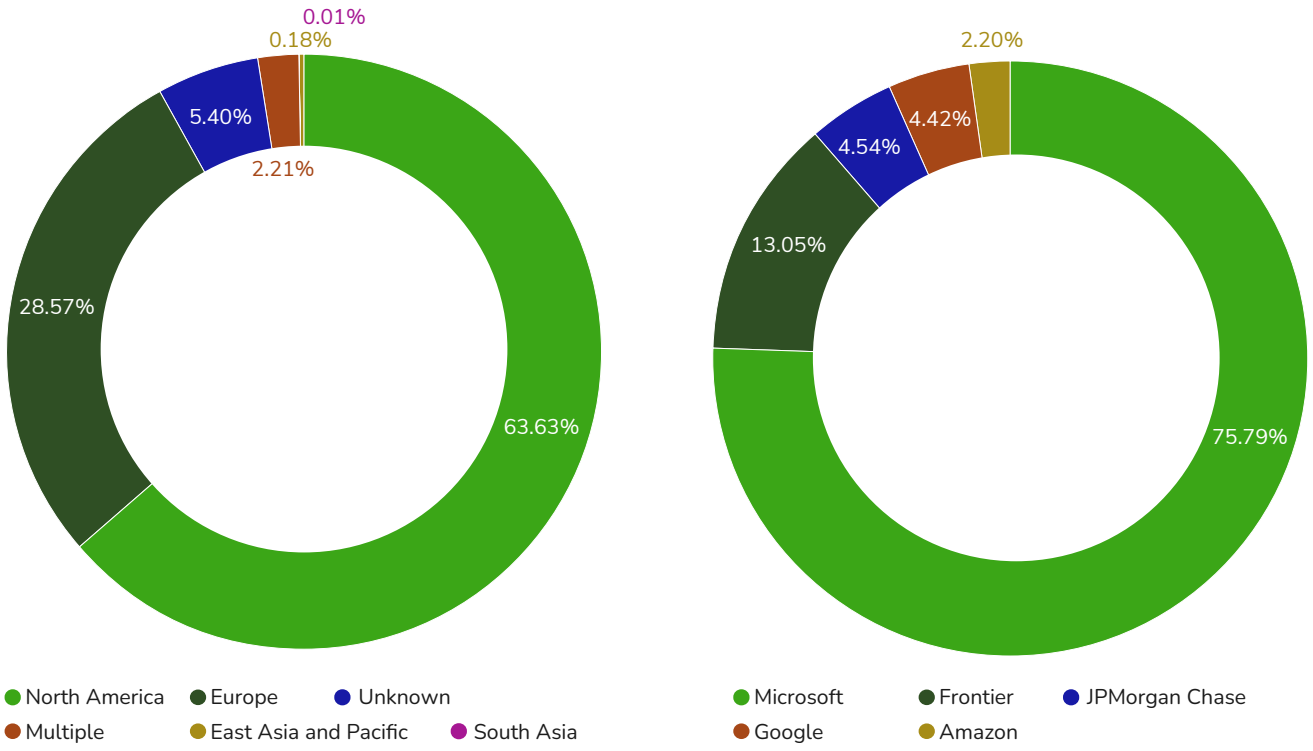

Figure 4: Geographic Distribution and Top Buyers of Engineered Carbon Removals ($MtCO_2e$) as of 16th March, 2025[14]

Market Challenges

If supported by clear standards and robust policy, the CDR market has been estimated to grow to between $20–135 billion annually by 2040[22]. This makes it not only a climate imperative but also a major economic opportunity.

Despite these positive signals, challenges remain. Supply is limited—only 33 Mt CO_2 of durable removals are expected to be available by 2030, far below projected demand of 40–200 Mt CO_2. Cost is another barrier, with suppliers needing between $140- $670 per tonne[23] to break even, depending on technology type, while buyers seek lower prices. These technologies need financing now to scale and achieve the expected fall in costs, which will unlock broader adoption.

Despite growing support from scientific bodies and governments to purchase high-integrity carbon credits, many corporates remain hesitant to invest actively in carbon projects. Some of the challenges to engagement include:

- **Reputational risk**: Companies fear being accused of "greenwashing" if the credits they purchase are later deemed low quality or ineffective.
- **Conflict with in-house decarbonisation**: Use of carbon credits may be seen as a diversion of investment away from long-term internal decarbonization. Environmental, social and governance (ESG) stakeholders increasingly demand that companies reduce emissions at the source rather than rely on external mechanisms. As a result, corporations may delay or minimize credit purchases to avoid the perception that they are outsourcing responsibility for emissions.
- **Market complexity and uncertainty**: the fragmented market, with wide ranging standards, project types and demand signals, has led to potential buyers delaying (or pausing) action as they wait for consolidation and greater guidance from policymakers.
- **Price variability and uncertainty**: Carbon credits have seen significant volatility given the voluntary nature of both supply and demand. Depending on project type, prices can vary from $2 for a low quality older vintage renewable credit to $1000 for a high-quality DAC credit. Pricing data for spot transactions is tracked by market analysts, such as MSCI, however there is limited visibility of agreed pricing for offtake agreements and other long-term investments.

Voluntary Standards and Frameworks Driving the Market

Current demand for CDR is largely shaped by voluntary net-zero standards and guidance such as those set by the Science Based Targets initiative (SBTi) which requires companies to neutralise residual emissions at their Net Zero year through carbon removals, or the Oxford Offsetting Principles which support a transition from avoidance and reduction activities toward 100% removals by 2050[4].

In March 2025, the SBTi launched a consultation on its revised Corporate Net Zero Standard which potentially incorporates interim removal targets as mitigation for unabated emissions along the journey to net zero[24,25]. If incorporated into the Corporate Net Zero Standard Version 2, this would provide useful motivation for investment in CDR alongside on-going reputational pressures, investor scrutiny, and regulatory expectations for transparent, science-aligned strategies[26,27].

Making a Corporate Climate Claim using Carbon Credits

There is considerable scrutiny of corporates that make claims associated with carbon credits, with numerous accusations of greenwashing over the last few years. In Europe, the Commission introduced the Empowering Consumers Directive[28] to tackle greenwashing. The Directive is effectively a ban on corporates making net zero or climate neutral claims in relation to products for marketing purposes. In order to support corporates to make eligible claims help them avoid greenwashing, however, the UK Government alongside other countries such as Switzerland, has recognised the role of high integrity carbon credits as part of corporate net-zero journeys. In November 2024 the Department for Energy Security and Net Zero published six principles for voluntary carbon and nature market (VCNM) integrity, followed by a consultation on the role of VCNM in April 2025. More recently, in June 2025 the UK, Singapore and Kenya announced the launch of the Coalition to Grow Carbon Markets[29], alongside France, Indonesia, Panama and Peru, it aims to encourage companies to buy carbon credits by setting out guidelines for buyers, a move carbon market experts say is the strongest show of policy support yet for such markets. The intention is to agree these guidelines by COP30 in Brazil in November, hopefully stimulating demand and helping channel billions of dollars of climate finance to countries in need. Notable proposals within the VCNM consultation include:

- Endorsing the Voluntary Carbon market Integrity Initiative (VCMI) Claims Code of Practice, alongside Scope 3 flexibility mechanisms, to encourage uptake of credits once companies have committed to science-based net-zero pathways that prioritise emissions reductions;
- Maximising participation in VCNM by creating new labels / schemes for companies that are not yet in a position to commit to science-based net zero targets;
- Endorsing ICVCM CCP-labels as an international benchmark of high-quality carbon credits, with consideration of mandating their use by UK-headquartered companies;
- Updating Environmental Reporting Guidelines (ERG) around VCNM and potentially mandating listed companies and financial institutions to follow these disclosure requirements;
- Developing official definitions or standards for key terminology (e.g., carbon neutral), clarifying the legal status of carbon credits, and considering improving governance of VCNM through options like licensing schemes, a dispute resolution ombudsman, etc.

Such initiatives will need to align with emerging voluntary corporate frameworks such as SBTi and ISO Net Zero standards[30] and also offer clarity on carbon accounting and what makes a credible claim. With uncertainty on the future of the EU Green Claims directive, and growing adoption of Article 6 mechanisms influencing national policies, investor uncertainty will greatly benefit from international, government-led direction.

3. The Business Case and Deal Structures for Funding CDR

To date, a combination of philanthropic support, angel capital, and fiscal incentives such as tax credits have helped to cover implementation costs and accelerate the development of novel CDR technologies. Until captured carbon dioxide is fully embedded into a circular, low-carbon transition economy however, and removal credits are mandated within emission reductions schemes to provide predictable demand for CDR at scale, the VCM remains the most viable mechanism to support the development of the industry.

The types of engineered CDR solutions being purchased in the VCM vary, with biochar currently accounting for the majority of transactions. Buyers are engaging through a range of commercial structures. Although spot purchases dominate in terms of transaction count, forward agreements account for the largest share of volumes purchased. This reflects a market where buyers are not only diversifying their technology preferences but also adopting more strategic and long-term procurement approaches.

Figures 5 and 6 illustrate the breakdown of engineered CDR purchases by technology type and transaction structure, highlighting both the breadth of market activity and the increasing sophistication of corporate engagement.

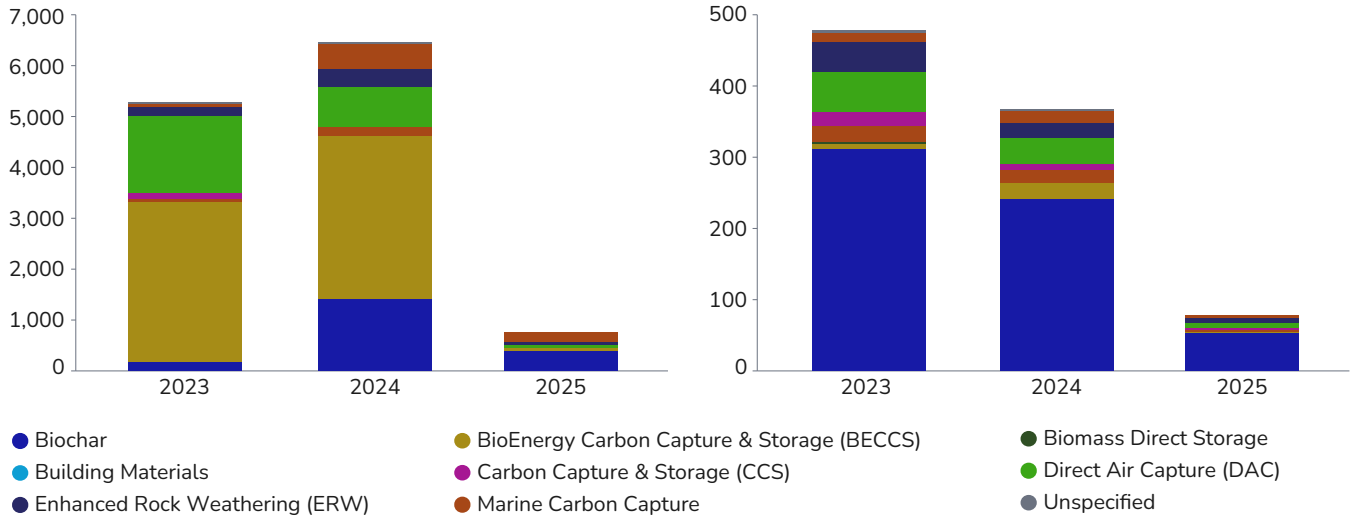

Figure 5: number of tonnes sold in $KTCO_2E$ (left) vs. Number of transactions (right) by project subtype as of 31st March, 2025[14]

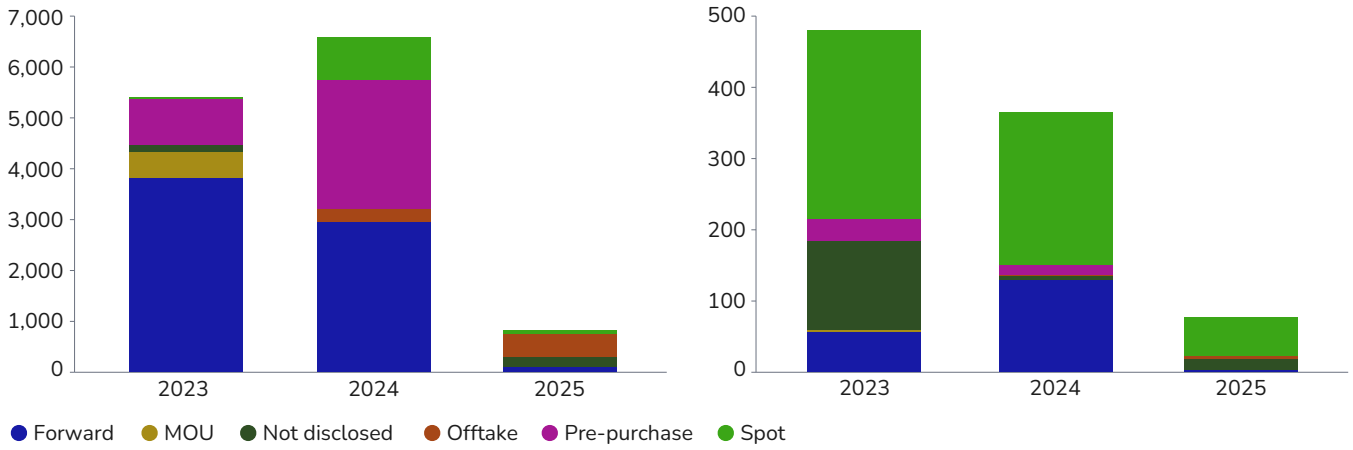

Figure 6: Number of tonnes sold in $ktCO_2e$ (left) vs. number of transactions (right) by transaction type as of 31st March, 2025[14]

Why should Corporates Act Now?

The majority of corporate demand for CDR today comes from the fulfilment of corporate sustainability objectives via the procurement of verified removal credits, generally accounted for under climate commitments as climate neutrality and net zero pledges (although it is important to reiterate there are real restrictions around using this terminology within the European Union to ensure carbon commitments are not misleading). This includes companies using CDR credits to neutralise residual emissions as well as those that use CDR technologies to decarbonise hard-to-abate segments of their own operations. AstraZeneca's recent £100 million partnership with Future Biogas[31] exemplifies this approach and will support biomethane production to heat several of AstraZeneca's manufacturing sites. The integration of a carbon capture and storage system within the facility will further support Scope 1 and 3 emissions reduction targets. Similarly, food and beverage companies, particularly those with agricultural inputs, have been exploring how biochar application can support decarbonisation within key supply chains.

Alternatively, while less common, direct investment into CDR supply to pursue strategic and financial goals can appeal to some companies with a core business alignment to CDR financing, as well as both financial and non-financial internal capacity to do so. For instance, large technology and engineering companies with dedicated venture capital to fund research, development, and innovation, are showing some appetite to back CDR, which can come with the mutually beneficial sharing of technological expertise. In addition, such partnerships can provide CDR developers with access to their backers and established network of suppliers and clients, further enhancing production capacity and market reach. In 2024, Siemens, through its Siemens Financial Services unit, signalled this ambition and leadership with investments in early-stage DACCS and carbon mineralisation companies.[32]

Early purchasing of CDR credits or direct investment for both financial and carbon credit returns will provide corporates with price visibility and increase their confidence in future supply. For those who are subject to compliance schemes and the likelihood of being required to purchase CDR, buying credits via the voluntary carbon market is a way to learn more about how to buy, and what to buy.

One of the challenges for corporates is how to lock in a supply of high-quality credits as a strategic measure to respond proactively to evolving climate expectations before market constraints intensify. Early market participation enhances certainty around future credit availability, particularly as global demand is projected to exceed supply in critical mitigation sectors. Market leaders such as Microsoft and Google are supporting the development and scale-up of both carbon removal technologies and nature-based solutions, catalysing the growth and scale necessary to deliver this important complement to long-term decarbonisation pathways. Through using even a small proportion of CDR credits as part of annual mitigation, corporates can help ensure early-stage projects survive and achieve scale.

The Science Based Targets initiative is exploring the inclusion of interim targets to address the impact of on-going emissions within its consultation draft of its Net Zero Standard[33]. Depending upon the results of the consultation, and the scope of the interim targets, this revision to the Standard could be a valuable near term driver for corporates to purchase CDR credits sooner rather than previously planned.

By acting decisively, corporates can establish a position of leadership and credibility, secure the supply required to meet both their interim and long-term targets, while contributing meaningfully to the development of a market that can meet future demand.

CDR Funding Pathways

Once the business case for corporate engagement is made, there exists several mechanisms to finance CDR, as illustrated in Figure 7.

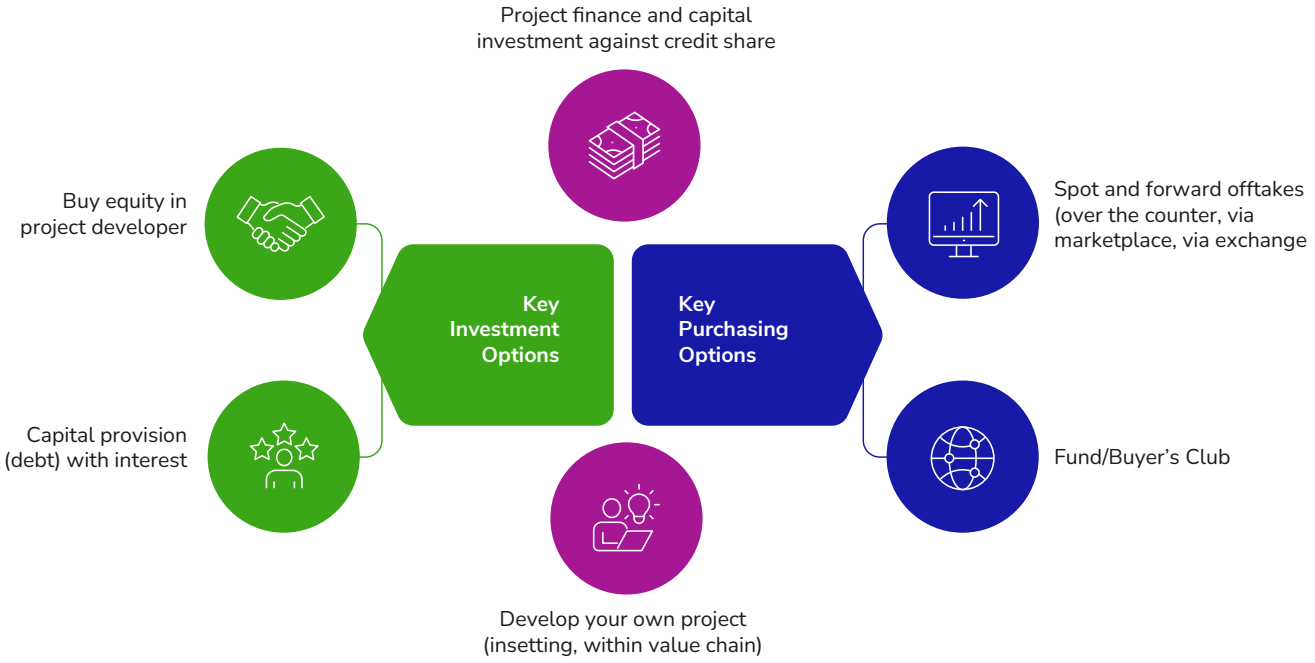

Figure 7: Carbon Market Funding Pathways

Some companies purchase verified 'spot' credits once they have been issued and are available on registries. Spot purchases are most often seen among companies with near-term neutralisation goals or those testing market participation before deeper engagement. This model offers reduced delivery risk, but the very limited current supply of CDR credits means that most companies seeking to purchase CDR credits need to explore multi-year contracting approaches for future delivery of credits.

Delivery date for credits can be several years aways, but forward contracts help companies secure supply for mid to long-term targets and manage price risk with a predictable payment schedule. Large individual buyers such as Microsoft and Google have been the most active proponents of this "offtake" model and negotiated multiple forward purchases of credits from a range of providers and CDR types. In April 2025, Microsoft committed the largest engineered CDR agreement to date for engineered removals from AtmosClear, an $800m investment for 6.74m metric tonnes over 15 years[34]. Google committed more than $100m in 2024 for carbon removal credits[35], including a $10m deal in 2024 with Holocene[36] that saw the company achieve a historically low price of $100 per tonne for future DACCS credits, secured by offering both a long-term commitment and a significant share of its total payment upfront, thereby derisking the supplier's capital expenditures and helping scale deployment.

Whilst corporate demand for CDR is growing, the market is nascent and characterised by a number of structural challenges that inhibit scale. The nature of CDR development involves sourcing significant upfront capital, navigating regulatory hurdles, multi-year development timelines to acquire land, feedstocks, and licenses to operate, and trust in new technologies and monitoring, reporting and verification (MRV) standards. These characteristics often conflict with what many corporates are comfortable committing to within a largely voluntary framework. Many corporate buyers are risk-averse, especially when operating in reputationally sensitive environments. In addition, engineered removals, including those available in the UK, cost far more than nature-based removals or even emissions reduction projects, which can discourage smaller and cash-constrained companies. This has led to the development of innovative solutions to overcome some of these barriers and stimulate market growth.

Innovation in Carbon Markets

A successful market needs strong supporting infrastructure that helps to de-risk investment and build confidence. A wide array of support is emerging to help organisations navigate the market. A particular area of focus has been on integrity and making it easier for corporates to identify high quality carbon credits. Ratings agencies play a critical role in driving quality, notably BeZero, Sylvera and Calyx Global. BeZero and Sylvera make their ratings publicly available – grading projects from D to AAA- and Calyx share tiers – from tier 1 to 3. BeZero has recently included ratings scorecards which open their ratings model up, helping users understand what the likely rating will be and how sensitive ratings are to different risk variables, driving better project quality at the design phase. In the case of Sylvera, they offer 'pre-issuance' assessments for early stage projects to understand which improvements could have the biggest impact on the quality of the credits they will produce.

Another area of innovation in the carbon market has been insurance. Insurance is commonplace across financial markets but until recently was unavailable in carbon markets. Insurance can now be used to help reduce risk exposure for carbon credit buyers and investors, in particular around deployment risk. Notable specialist carbon insurance providers include Kita, Carbon Pool and Oka.

Carbon marketplaces – platforms helping scale the market through matching credit buyers with sellers – have evolved over the past few years, adapting to the needs of the market and using digital, technical and financial innovation to support project developers and corporate buyers. US based Patch, for example, has engineered a platform to streamline companies' CDR procurement, including strategy, sourcing, diligence, purchase and management phases, and can filter and compare millions of tonnes across a variety of engineered CDR projects. UK based CUR8 is pioneering routes to provide access to flexible financing for project developers (see below).

Finance innovation case study: CUR8

CUR8 is a UK-based company focussed on accelerating business adoption of high-quality carbon removals. After identifying that access to high quality, engineered removals that balance price with credit delivery timing was a major limiting factor for potential buyers of carbon credits, it developed a portfolio approach including removals across several technologies, reducing the overall delivery risk for purchasers.

CUR8's engagement with project developers also highlighted that access to more flexible financing was needed, but that banks were not always knowledgeable about the nascent CDR sector, and concerned about credit risks, so unable to offer financing. Building on the learning from structuring a first-of-a-kind financing for the enhanced rock weathering company UNDO with Standard Chartered and British Airways, in early 2025 CUR8 launched an offtake financing product. The product can help developers access low-cost debt capital and banks better understand the CDR sector, which are both critical for a sector looking to scale and broaden the types of capital available to support CDR projects.

Efforts to reduce exposure to risk have also led to a proliferation of collective investment structures, including buyers' clubs, accelerators and funds. All three structures typically see groups of companies acting together to amplify the impact of their investments, for example Frontier, a buyers' club focused on engineered carbon removal, and Symbiosis, a buyers' club investing in nature-based removal (see more on collective investment below).

Philanthropy remains an important route to accessing finance and can help raise the profile of early stage CDR initiatives. XPRIZE, a non-profit organization that aims to accelerate breakthroughs in areas such as learning, exploration, energy, environment, global development and life sciences, launched a $100m prize in 2021 specifically for innovation in carbon removal. The 2025 grand prize winner (out of 1300 global entrants) was Mati Carbon's enhanced rock weathering project, receiving an investment of $50m[37]. Mati Carbon has also secured an innovative debt facility from J.P. Morgan, backed by credit support from the Schmidt Family Foundation.[38] This direct funding will support the viability of the technology as it scales and help avoid the early-stage challenges faced by many promising initiatives. As another example of catalytic philanthropy in the CDR sector, Terraset are a US-based organisation which pool tax-deductible donations and make strategic purchases of high-quality carbon removal.

As the CDR sector develops and matures, we need to continue seeing innovation to tackle the challenges in each technology pathway and help attract the investment the sector needs to reach scale.

The Evolving Role of Collective Investment

Buyers' clubs (collaborative groups of companies or institutions that pool resources to invest in carbon markets) have emerged as a promising model that reduces risk for buyers and can play a catalytic role for suppliers. By aggregating demand, buyers' clubs can negotiate better prices, enhance suppliers' revenue predictability and delivery reliability through larger orders, and reduce chances of individual reputational harm. Buyers' clubs also provide a platform for knowledge-sharing and due diligence, increasing confidence in the credits being purchased.

Whilst the usual model is for buyers to pay upon delivery of credits, collective investment can play a more catalytic role by committing capital to advance market infrastructure and pre-finance high-quality carbon projects. These initiatives play a dual role: supporting supply development whilst fostering trust and accountability. They can also help accelerate investment by offering standardised procurement frameworks and co-investment opportunities that reduce the barrier to entry for less experienced corporate participants, in addition to providing suppliers with predictable revenue signals necessary to secure financing.

Finally, carbon funds such as Carbon Direct Capital[39] aim to raise capital to invest in CDR projects, providing returns to investors in the form of either financial dividends or credits, or both. Investors benefit from a centralised, dedicated mechanism run by a professional fund manager responsible for project selection, due diligence, contracting, and oversight.

Examples of these various types of collective investments include:

- **Frontier**[40], an initiative specifically established to accelerate the development of permanent carbon removal technologies by guaranteeing future demand for credits. It aims to purchase over $1billion+ in permanent carbon removal technologies between 2022 and 2030. Founding investors included Stripe, Google, Alphabet, Shopify, Meta, and McKinsey.
- **Climate Transformation Fund**[41], a partnership between Klarna and Milkywire, that offers a "best-practice alternative to carbon credits": a curated portfolio of high impact projects driving global net-zero.
- **NextGen**[42], a South Pole/Mitsubishi Corporation joint venture that aims to establish the "world's largest diversified portfolio of permanent carbon dioxide removals to scale the market."
- **Symbiosis**[43], a coalition of corporate buyers, including Google, Meta, Microsoft, and Salesforce, that aims to accelerate and scale high-quality, nature-based carbon removal projects by contracting up to 20m removal credits by 2030.
- **Aviva Investors Carbon Removal Fund**[44], a global Article 9 fund seeded by Aviva's Investment, Wealth and Retirement business, provides institutional investors access to high-integrity nature-based and engineered carbon removal solutions, including afforestation, peatland and mangrove restoration. It targets long-term net-zero alignment and co-benefits, with projects such as the 1,800-hectare Glen Dye Moor restoration expected to capture over 1.4 million tonnes of carbon.

In Canada, a new buyers' club is being established to commit $100 million CAD (approximately $72 million USD) to advanced market purchases of Canadian CO_2 removal credits. This initiative aims to boost investment in and support for domestic CDR projects.

The quantum of investment offered via buyers' clubs and coalitions provides them with more influence than individual investors. These groups have the potential to drive greater transparency, consistency and credibility in the VCM and, perhaps most importantly in this nascent market, offer working capital to seed and scale CDR projects, although it is still more typical to pay on delivery.

Buyers' club initiatives remain concentrated in the US and Europe, with limited UK-based coordination to date, and membership may require relinquishing full control over credit purchases.

The Important Role of Institutional Investors

Even when there are offtake agreements in place at the scale that buyers' clubs can offer, developers can still struggle to secure low-cost finance due to the nascency of the technologies and the lack of historic data to help institutional investors quantify the risk of investing in such projects. The market also needs more widespread, consistent demand signals and predictable credit purchasing schedules from creditworthy offtakers to encourage financiers to provide patient upfront capital and play their traditional role along the risk curve to mitigate voluntary buyers' risk aversion.

In the financial sector, some commercial banks and lending institutions are exploring how to incorporate CDR into their core operations – either by underwriting credit lines to CDR projects or by incorporating removals into products and services. The latter remains in its infancy, but banking services provider SEB has also taken steps to boost demand for CDR transactions by partnering with crediting standard Puro.earth and structuring purchasing agreements for Puro.earth CDR credits amongst its client base[45].

The potential use of blockchain to create and track carbon credits is an area of growing interest. In July 2025 JP Morgan announced that its blockchain business unit, Kinexys, is developing and testing a new blockchain application to tokenize global carbon credits, with the aim of resolving key standardisation, transparency and audibility challenges that hold back the VCM[46,47].

The Role of the Public Sector

The public sector has a critical role to play in stimulating and multiplying investment in CDR from private sector investors. Put simply, any strong policy commitment can boost confidence in demand, whether through financial incentives such as tax credits and Carbon Contracts for Difference, or through some form of requirement for corporates to purchase CDR. Mandatory options could take various forms, including but not limited to – requiring large infrastructure projects to require a 'CDR component', target-setting or small purchasing requirements on large listed companies, or amendment of public procurement standards to include CDR targets or purchasing. An Oxford University policy paper[48] has argued for a Carbon Takeback Obligation (CTBO) - a policy that requires fossil fuel producers to permanently store a growing percentage of the CO_2 generated by their products, placing the responsibility for carbon storage on those who extract and import fossil fuels, rather than solely relying on end-users or government.

An example of government led commitment is the Swiss Climate and Innovation Act 2021 which sets specific CDR targets within the Swiss National Long-Term Strategy[49], with a roadmap for both CCS and CDR. It aims to remove 7Mt of CO_2 per year, including at least 2Mt CO_2 from within its national territory by 2050. The focus of the Act is on BECCS and DACCS, with other novel CDR methods referenced (e.g. Biochar). The roadmap guidelines set a mandate for corporates to include a development path for negative emissions, with a 'continuous, ideally linear, build-up path to 2050' and intermediate targets in 2030, 2035, 2040 and 2045.[50]

Switzerland's Carbon Removal Platform[51] was also founded in 2021 to connect stakeholders and stimulate engagement and investment. It identified five key actions[52]:

- Facilitate interconnected stakeholders;
- Establish clear legal frameworks;
- Promote CDR Research, Development, Demonstration, and Deployment;
- De-risk first CDR movers and investment in CO_2 infrastructure;
- Engage in bilateral and multilateral agreements.

Real, timely market stimulation is going to take a combination of levers acting on both demand and supply.

- Both the UK and EU are exploring the integration of domestic CDR within future phases of their Emissions Trading Systems (ETS). This is a long-term demand stimulus, however, and without mandatory allocations or price adjustment mechanisms it is possible that the allowance price would be too low to incentivise compliance using the more expensive CDR credits without additional fiscal measures such as Carbon Contracts for Difference (CCfD).
- The UK Government is developing the Greenhouse Gas Removal (GGR) and Power BECCS business model involving a CCfD to incentivise private investment in projects. Similar to the models used for low-carbon electricity and Carbon Capture, Usage, and Storage (CCUS), the CCfD is designed to act as revenue support to suppliers by committing to make up the difference between the price a carbon credit can attract on the market and the cost of delivering that credit. A CCfD can help mobilise capital and de-risk private investment by showing there is a clear revenue stream in place, but it is the responsibility of the developer to negotiate the offtake contract in the first place. This model will direct funding towards DACCS and BECCS and would need to be part of a wider range of initiatives to support and scale other emerging technologies.

In order to be ready for ETS integration the UK and EU need to have confidence in the supply of CDR credits, and whether current policy proposals are sufficient to attract investment and scale CDR. The UK Government is currently reviewing the policy landscape via an Independent Review into GGRs to better understand what is possible, and how best to support these technologies.[53]

Three UK research councils and central government funded the £8.6m Greenhouse Gas Removal Research Programme[54] investigating the feasibility of large scale removal of carbon dioxide and other greenhouse gases from the atmosphere to achieve climate policy goals, and the National Wealth Fund (NWF) recently announced a £28.6m equity investment into a joint venture for a CO_2 transport pipeline. Other organisations such as the British Business Bank (BBB)[55] could potentially support CDR initiatives at start up stage with loans and wider support such as mentoring. The BBB also works to support access to finance and is the largest investor in UK venture and venture growth capital funds - in June 2025, the Government increased its total financial capacity to £25.6bn.

Ultimately, if governments want the private sector to invest in, and bear the burden of the cost of CDR technologies, they need to develop a clear, joined-up policy environment that stimulates both the buy side and the sell side, and offers long-term confidence and stability. CDR investments are growing and have the potential to scale with the right stimulation. The market is however constrained by policy uncertainties and the criticisms some buyers have faced over VCM integrity.

4. Conclusions

Despite challenges and complexities, this is a good time to engage in the carbon market for the following reasons:

- The role of carbon credits in a credible climate strategy is becoming mainstream, with consolidation across national and international policy.
- Global market infrastructure is converging, driving quality and increased trust in the integrity of climate impact.
- The current supply trajectory is limited, and early investment or offtake contracts can play a key role in ensuring we have a secure supply of CDR in the future. Innovative CDR projects with the potential to scale require up-front capital and long-term offtake contracts to succeed.
- There is an opportunity for corporates to play a catalytic role in the development of technologies that will reduce emissions within their supply chains, such as low carbon building materials.

The investment needed for CDR to scale still faces headwinds. GFI and ERM have outlined some key themes to reduce friction and to stimulate CDR investment:

- **Private sector: Now is the time to build a strategy for CDR as part of climate transition plans and sustainability goals.** Purchasing of carbon removals will be necessary to achieve net zero, including those aligned with initiatives such as the SBTi. Setting interim (even if small) targets for purchasing carbon removals to tackle residual emissions, and monitoring progress against them, can increase credibility that long-term net zero goals are both realistic and achievable.
- **Private sector: The development of internal carbon pricing** will help companies assess the relative cost of decarbonising operations versus the cost of sourcing carbon credits or facing regulatory costs such as carbon taxes or ETS compliance. Putting a value on greenhouse gas (GHG) emissions will help drive investment in reduction, and after that guide corporates on the shortfall that could be made up using high-integrity carbon credits.
- **Private sector: Explore the options for investing in long-term supply of carbon removal in line with strategic priorities and budget, for example direct investment or participation via carbon marketplaces.** Aggregated demand through carbon marketplaces can help catalyse investment in early-stage projects. They come with the benefit of handling the sourcing of relevant projects carrying out due diligence, structuring contracts and also reduced risk from investing alongside others.
- **Private sector: Consider ways to achieve financial returns and support CDR project development e.g. through equity**. For some corporates, equity investment in CDR technologies can provide a financial return or open up additional revenue streams such as the sale of low carbon building materials or waste heat.
- **Private sector: Explore options to facilitate CDR purchasing within supply chains**, supporting efforts to scale up the carbon removal market and ultimately achieve net zero across the supply chain. Specific examples of supplier-oriented carbon removal programmes include Apple's Restore Fund and Amazon's Sustainability Exchange.
- **Public-private sector: Structured finance to support early-stage projects.** Structured finance involving public and/or philanthropic capital will play a key role in de-risking early stage engineered CDR projects. High upfront costs and technology and delivery risk are to be expected in a nascent sector, but attracting private sector capital is critical to scaling CDR over the long term. Various options to de-risk could be effective including guarantees and flexible, patient capital
- **Public-private sector: Prepare for integration of carbon credits into compliance markets** Corporates within scope of emissions trading schemes should be particularly engaged given the potential for CDR to enter compliance markets over the coming decade. By purchasing even small amounts of credits now, corporates gain an understanding of carbon markets and carbon credits. Furthermore, their experiences and the transactions they carry out are a valuable reference for government, helping inform policy design to support CDR.

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