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Carbon Direct

State of the Voluntary Carbon Market

CLOSING THE CARBON DIOXIDE REMOVAL DEMAND GAP | FEBRUARY 2026

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Acknowledgements

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About Carbon Direct

Carbon Direct is a science-first organization that combines technical and commercial expertise to decarbonize the global economy. Our 70+ scientists work closely with our finance and market experts to design, diligence, and deliver decarbonization solutions across industries. From Microsoft to JPMorganChase, Carbon Direct helps leading companies with carbon dioxide removal, carbon measurement, firm clean power opportunities, and low-carbon energy solutions. To learn more, visit www.carbon-direct.com.

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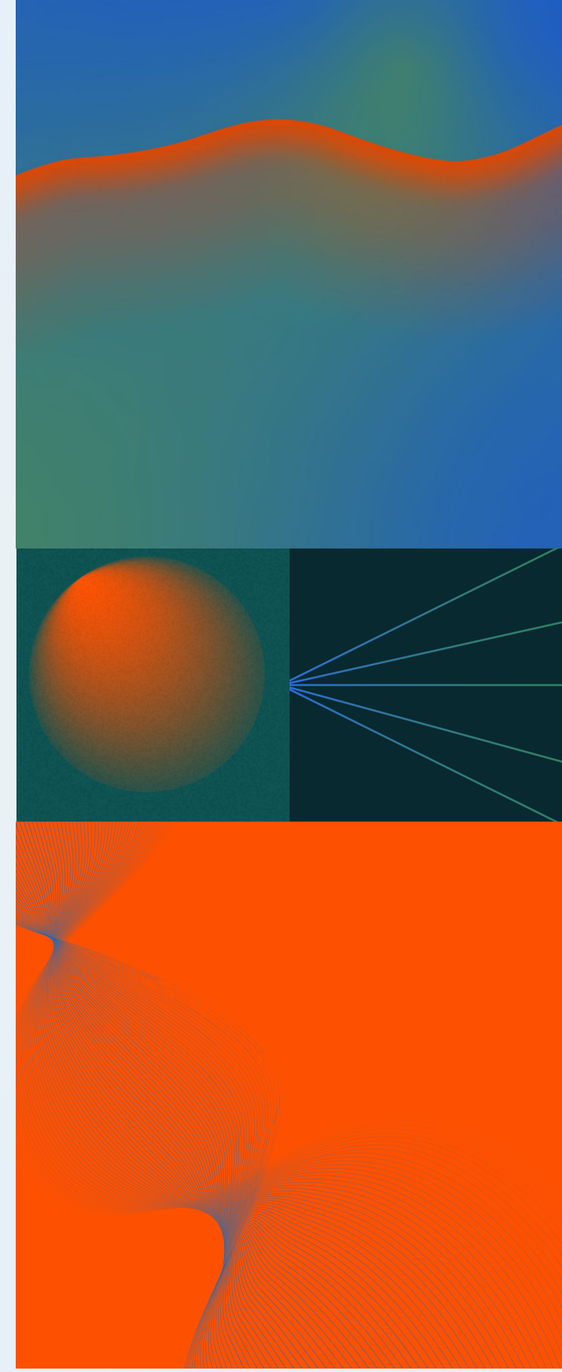
Executive summary

The voluntary carbon market (VCM) risks stagnation, with long-term costs to our climate. Limiting overshoot of 1.5°C requires deep emissions reductions alongside rapid scale-up of **carbon dioxide removal (CDR)**. The VCM remains a critical mechanism for early CDR deployment, providing a pathway for organizations to address their residual emissions and direct capital toward climate action. Yet going into 2026, aggregate market activity remains flat.

Most organizations with 2030 climate goals have yet to engage in the carbon market. CDR deployment heavily depends on forward delivery contracts. Without clear market signals today, CDR supply will falter, and companies may struggle to meet their targets in 2030. While many companies continue to set climate targets, the gap between reality and ambition is widening as actual purchasing lags far behind anticipated market growth. Scenario analyses referencing corporate targets point to a CDR market of up to two gigatonnes (Gt) by 2050, but extrapolations from current activity suggest a far lower near-term trajectory. To get climate action back on track, more tangible, public commitments to CDR must be made and executed. While some buyers remain reluctant to engage in the absence of clear regulatory and standards guidance, they risk falling behind competitors when policies eventually do come into force and access to high-quality CDR tightens.

CDR supply shows both progress and fragility going into 2026. Investment in **nature-based CDR** could lead to credit generation sufficient to support demand from today's active buyers, but insufficient to support 2030 corporate decarbonization targets from new buyers. **High-durability CDR** pathways faced a steeper challenge. A small cohort of projects have the committed demand needed to deploy successfully. However, most projects cannot deliver without more diversified and bankable offtake to unlock project finance, along with **project assurance** support. Without a stronger demand signal, a significant share of planned high-durability CDR projects risk becoming insolvent. Bankable offtakes are necessary to ensure high-quality projects come to market.

For too many, 2025 was a year of hesitation rather than action. Policymakers must recognize the cost of delay, and standard setters must provide clearer guidance. Ultimately, buyers who intend to rely on high-quality CDR to meet their climate goals must transition from commitment to execution, supported by necessary structures to act credibly and at scale. Early movers will define the market's standards, while latecomers may face volatility and uncertain supply.



KEY TAKEAWAYS FOR BUYERS OF CDR

Demand must activate.

Waiting risks a crowded market, tightened access to high-integrity supply, and escalating prices across CDR pathways.

Make contracts bankable.

Long-term offtake agreements can be structured to reduce project risk, improve supplier liquidity, and unlock lower-cost capital—often determining whether a project is built at all.

Use assurance to de-risk delivery.

For major projects, independent project assurance can surface risks early and tie payments to execution, improving the odds of on-time, on-budget credit delivery.

Use purchasing power strategically.

Balance exploratory purchases that help validate new CDR pathways with committed offtake that enables large-scale CDR deployment.

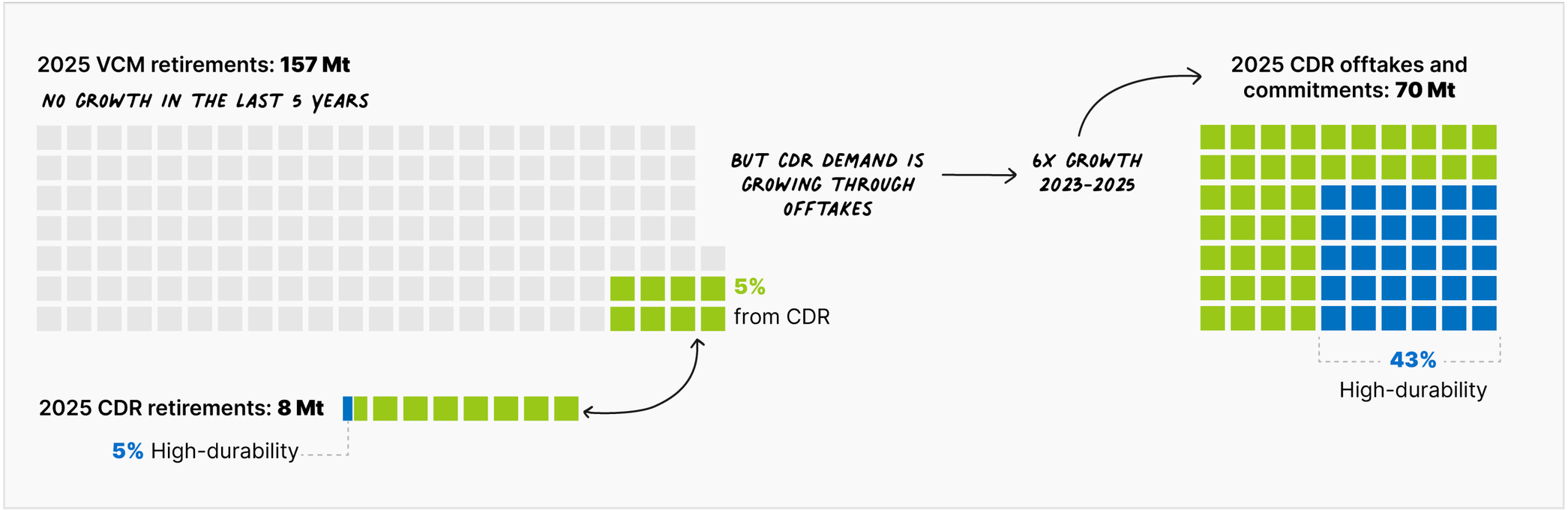
Match diligence to commitment size.

Light-touch screening is sufficient to triage early pipelines, but large, multi-year offtakes and investments require rigorous scientific and technical evaluation.

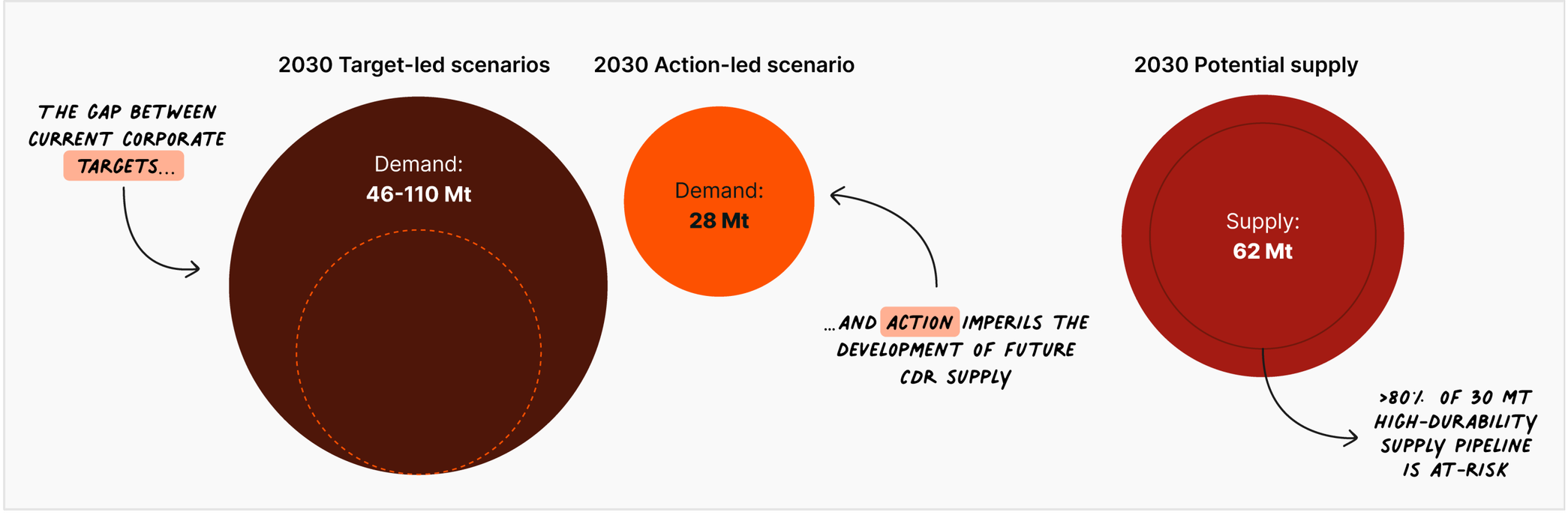
Strengthen market signals through transparency.

Publicly disclose retirements and purchasing intent, and support shared definitions of quality to reduce uncertainty for suppliers and investors.

THE MARKET TODAY



THE MARKET IN THE FUTURE



Based on corporate commitments, **demand for CDR is projected to grow 7–14× between 2030 and 2040.**

To meet these targets, companies need to act on their targets and begin procuring today.

Voluntary carbon market 101

The VCM is a buyer-driven, non-regulated marketplace where organizations purchase carbon credits to address residual emissions *while* prioritizing direct emissions cuts.

Credits enter the market through major **registries** (e.g., Verra, Gold Standard, American Carbon Registry, Climate Action Reserve) that approve specific **methodologies**, require third-party validation and verification, and then **issue** credits to the market. A climate claim is only made when a credit is **retired** (taken out of circulation). Credits can be bought on the **spot market**, meaning already-issued units are purchased for near-term delivery and retirement. Registry **issuance** commonly serves as a proxy for spot-market supply and retirement serves as a proxy for spot-market demand. Credits can also be bought via **forward-offtake agreements**, where buyers commit today to purchase future credit deliveries, enabling project finance and scaling, especially for CDR supply.

A carbon credit represents one metric tonne of carbon dioxide (CO_2), or its equivalent in other greenhouse gases, that is avoided, reduced, or removed. **Avoidance and reduction credits** come from project activities that prevent or reduce emissions that would otherwise occur, such as avoiding deforestation, destroying refrigerant gas,or capturing methane at landfills. Carbon dioxide removal (CDR) credits are issued when greenhouse gases that have already been emitted are taken out of the atmosphere and durably stored for decades to millennia.

CDR credits are often described as coming from three categories, defined by the capture and storage solution a project uses: **nature-based**, hybrid solutions, or engineered (**figure 1**). In this report, the latter two categories are grouped into one broad category, referred to as **high-durability CDR**.

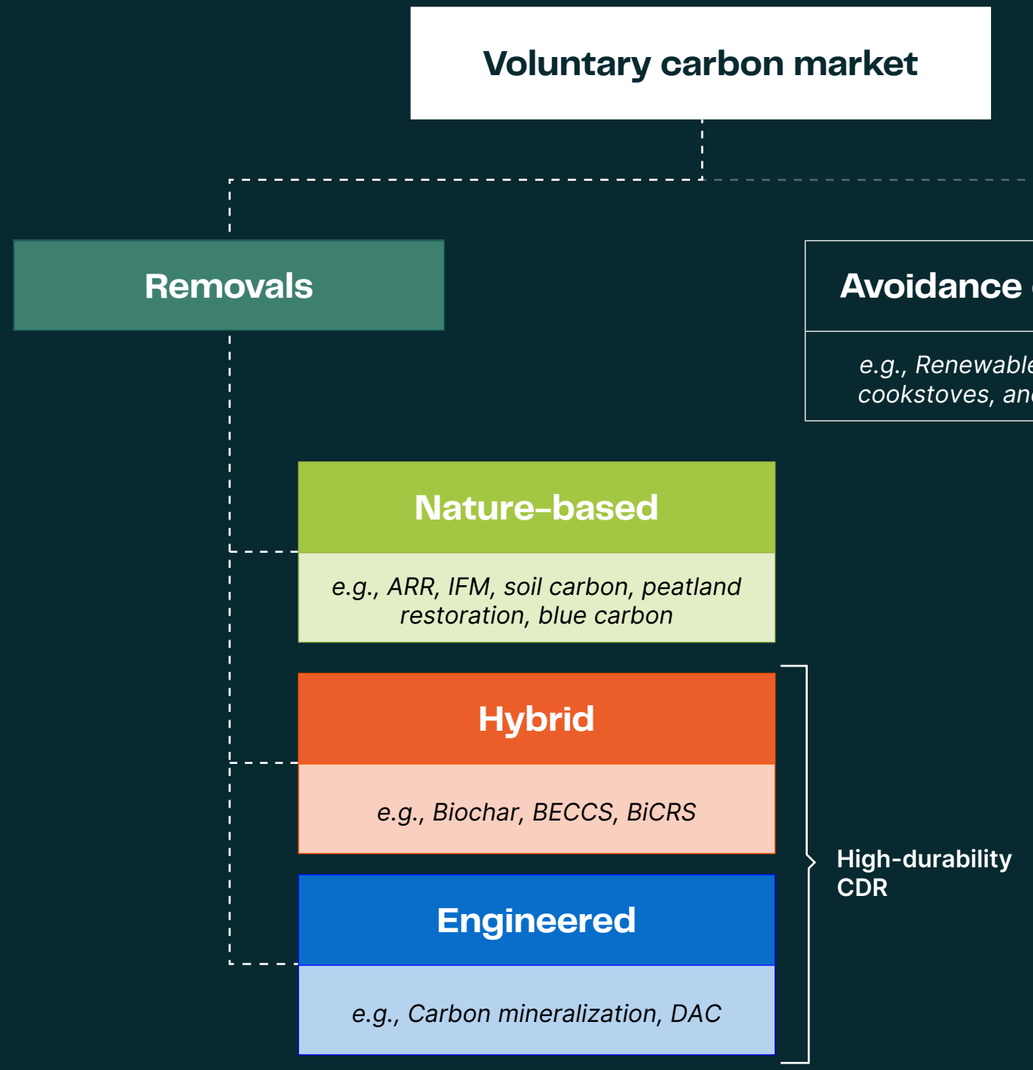
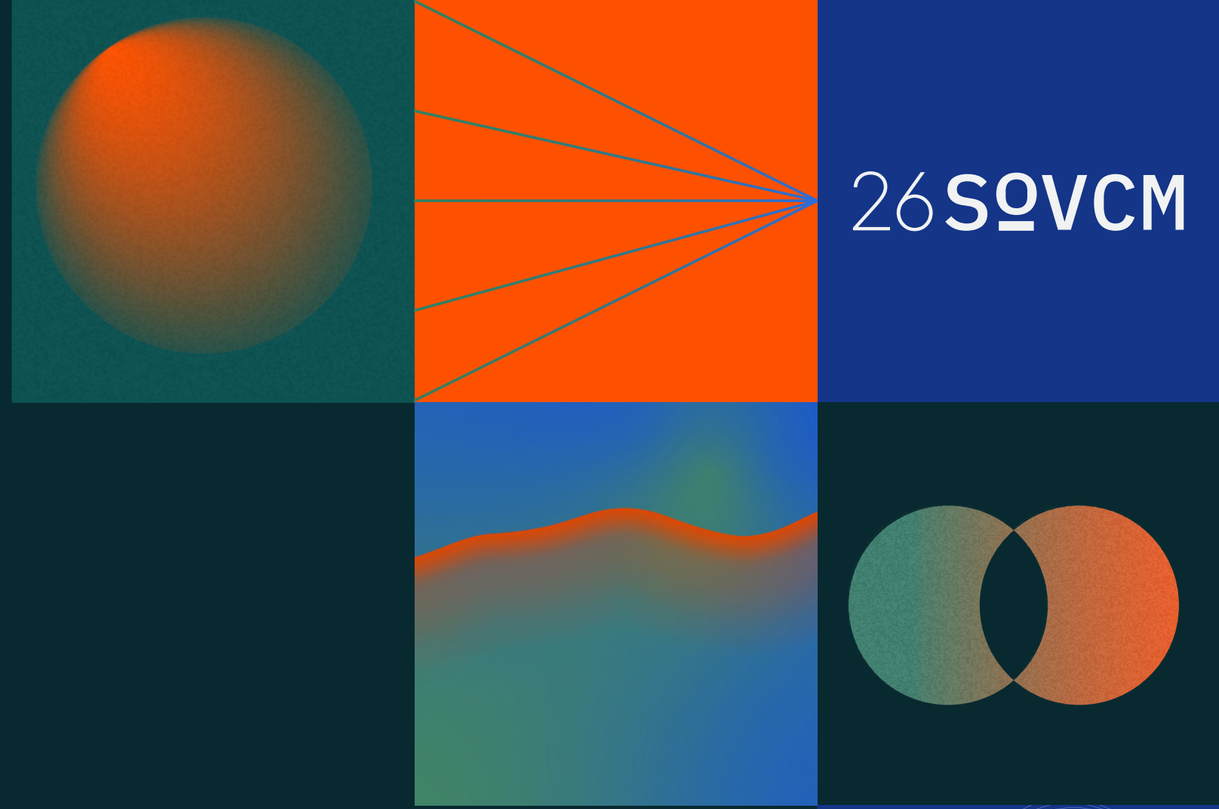


Figure 1. Types of carbon dioxide removal (CDR) projects in the voluntary carbon market, categorized by approach. In this report, we describe hybrid and engineered projects as "high-durability CDR." Note: ARR = afforestation, reforestation, and revegetation; BECCS = bioenergy with carbon capture and storage; BiCRS = biomass carbon removal and storage; DAC = direct air capture; IFM = improved forest management Source: Carbon Direct.



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A flat VCM must grow to meet ambitious projections

The VCM has stalled. For five consecutive years, muted growth and persistent oversupply of poor-quality credits have defined the VCM. In 2025, credit retirements—a proxy for historic spot-market demand—reached 157 million metric tonnes (Mt), down 7% from 2024, while issuances—a proxy for supply—totaled 288 Mt, up 3% from 2024 (**figure 2**). This incremental growth is far below what market analysts anticipated earlier in the decade, when several projections expected demand to exceed 1 Gt by 2030. With demand essentially flat for the last five years, the market is no longer on a plausible path to reach those projections.

Across the VCM, supply continued to outpace demand: credit issuances exceeded retirements by roughly 80% in 2025, adding to an already substantial surplus of more than one billion credits. Average prices for credits currently available in the market have remained relatively stable, buoyed by higher prices for a smaller subset of high-quality credits.

The VCM has been historically concentrated in avoidance and reduction credit types. Of these, REDD+, renewable energy, cookstove and non-CO_2 projects continued to represent the bulk of the market in 2025. CDR credits accounted for only 5% of 2025 retirements, but have a more active **forward offtake** market. High-quality credit supply is emerging—its success will depend on active buyers.

Still, procuring high-quality credits requires careful assessment and assurance. Academics estimate that fewer than 16% of credits issued to date represent real emissions reductions. Across project types, estimated "real tonnes" range from near zero (e.g., renewable energy) to roughly two-thirds (e.g., certain superpollutants), underscoring the uneven distribution of quality across the market. Even within the CDR category, low-quality supply is a risk. Applying our *Criteria for High-Quality Carbon Dioxide Removal*, less than 10% of the CDR projects Carbon Direct reviews meet a high-quality threshold with minimal reservations.

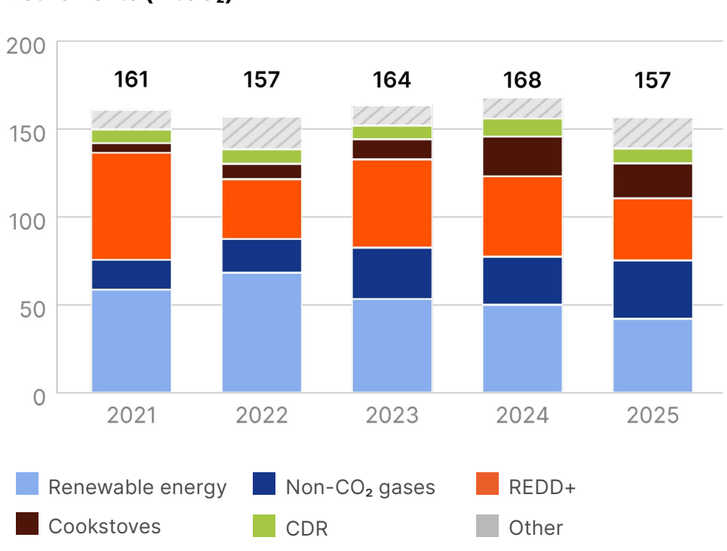
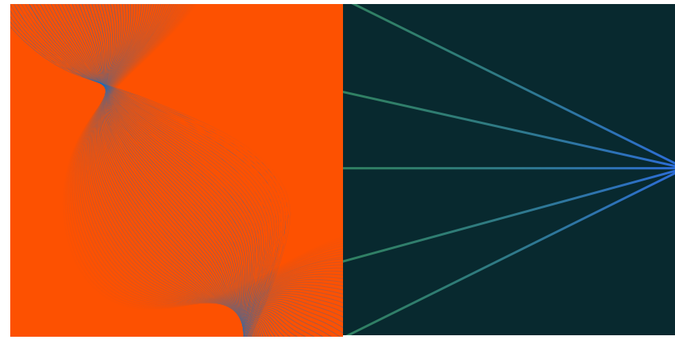


Figure 2. Carbon credit issuances and retirements by credit category from 2021-2025 across the five largest registries and Puro.earth. Note: $MtCO_2e$ = megatonnes of carbon dioxide equivalent. Other includes categories such as energy efficiency, fuel switching and waste heat recovery. Source: Carbon Direct.

Relative to 2024, carbon credit retirements from the major VCM registries in 2025 shrunk by

7%



SPOTLIGHT

Current growth rates are insufficient to meet long-term climate goals

Reaching long-term climate goals will require CDR to scale from today's megatonne-level activity to gigatonne-scale deployment. The Intergovernmental Panel on Climate Change estimates that meeting the goals of the Paris Agreement could require 6–10 Gt of CDR annually by 2050. Starting from current levels, annual market growth rates of 30% or higher are required to approach this trajectory. More moderate growth, around 20% per year, would still leave total deployment well below 1 Gt by mid-century, falling far short of climate-aligned pathways (**figure 3**). Without sustained, rapid growth in demand, the CDR market is unlikely to develop at the scale required to meaningfully contribute to global climate goals.

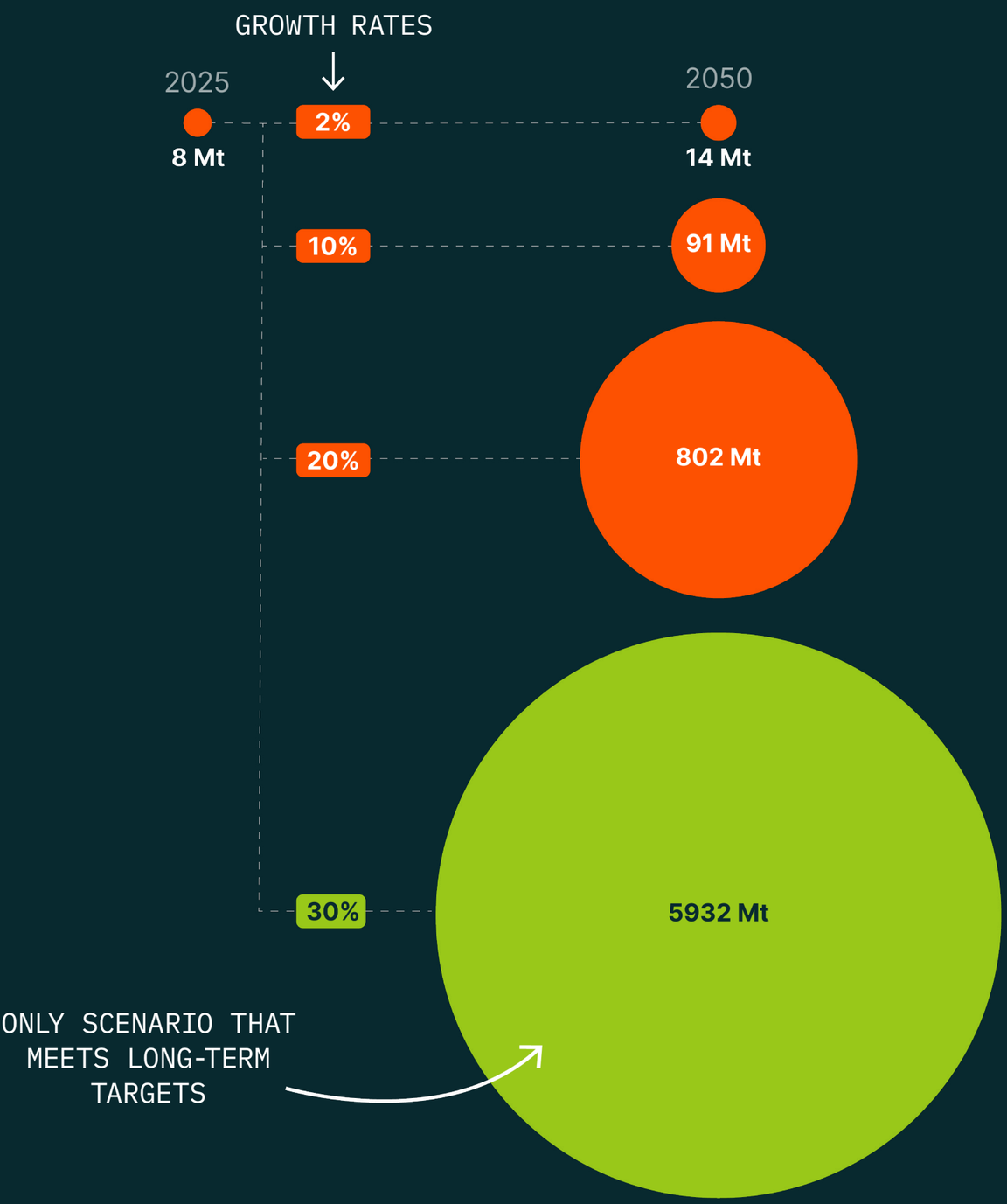


Figure 3. Carbon dioxide removal retirements in Mt, under different growth rates. Note: Mt = megatonne. Source: Carbon Direct.

Overall market stability obscures large shifts across credit types

Stable VCM activity masks a pronounced divergence in the balance between supply and demand across some major credit types. Examining trends across different credit types highlights the more dynamic market activity that occurred in 2025 (**figure 4**).

More balanced supply and demand in REDD+ credits: REDD+ issuances, excluding jurisdictional REDD+, have fallen sharply in the last two years, by more than 40% compared to 2023 levels, as projects transitioned to updated methodologies that address overcrediting concerns, particularly Verra's consolidated REDD+ framework. Despite reduced supply, retirements did not decline materially, fluctuating year on year but remaining at roughly the same level as in 2022. This dynamic is likely to shift once new methodologies come online.

Oversupply in cookstove credits: Cookstove credits represented the opposite dynamic. They remain one of the most oversupplied large-volume categories. Issuances have far outpaced retirements for several consecutive years. Cookstove methodologies have faced intensive scrutiny, but demand may increase due to recent Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) approval.

Shifting supply in afforestation, reforestation, and revegetation (ARR) credits: ARR credits face supply constraints. These projects tend to have longer development timelines, and few high-quality projects currently offer credits that buyers can retire on the spot market. As a result, ARR supply remained particularly tight through 2022–2024. Buyers competed for limited volumes from established projects. While new issuances increased in 2025, many new projects under updated methodologies, such as Verra's VM0047, may not issue meaningful credit volumes for several years.

Ratio of issuances to retirements

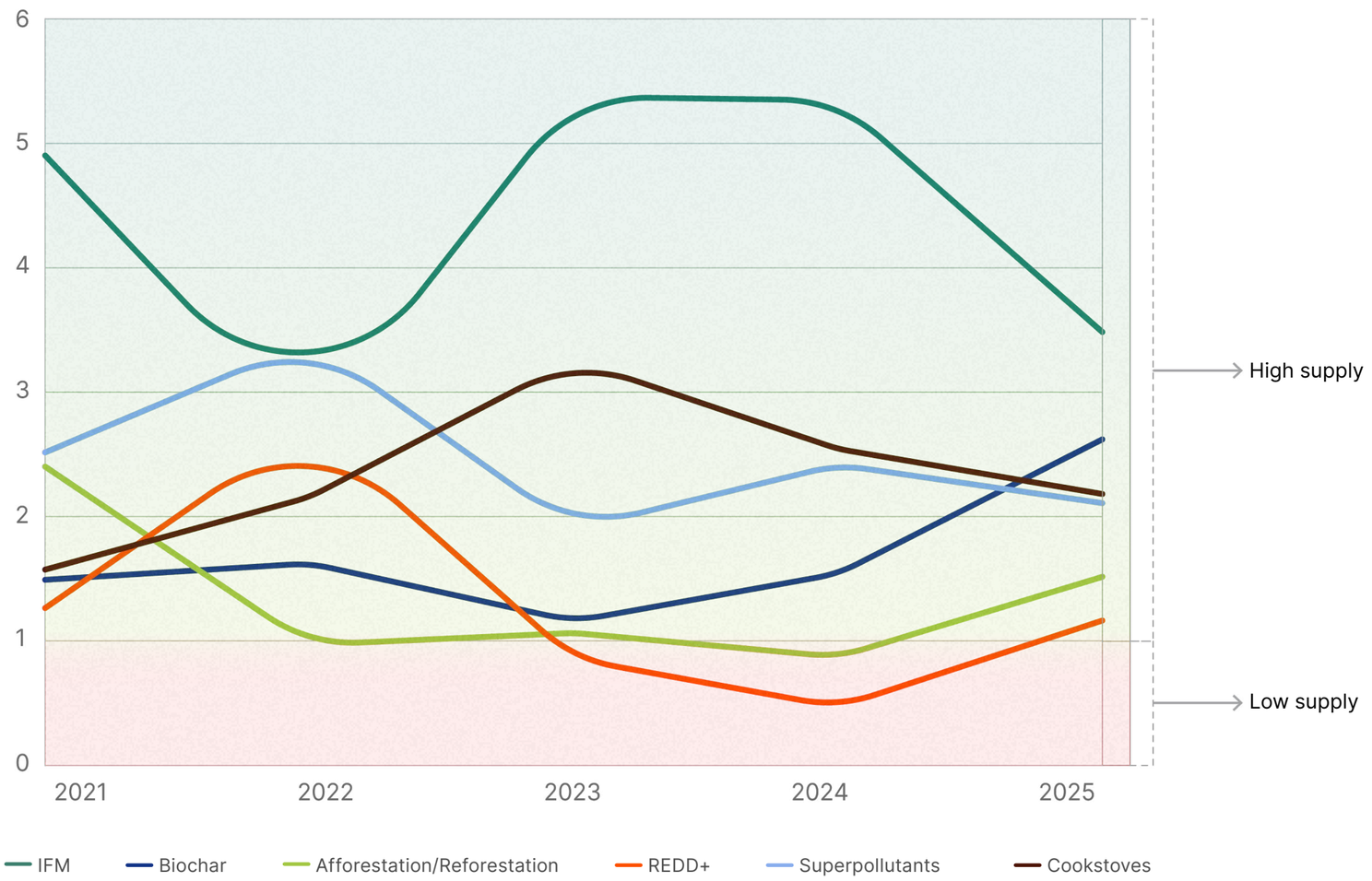


Figure 4. Supply and demand balance of in-year credits, based on the issuance-to-retirement ratio of credits across major credit types, from 2022 to 2025. Note: ARR = afforestation, reforestation, and revegetation, IFM = improved forest management. Source: Carbon Direct.

SPOTLIGHT

Commitments from prominent buyers brought superpollutants into focus

Superpollutants are non-CO_2 molecules (e.g., methane, F-gases, nitrous oxide) that have high warming potency in the atmosphere over the near term. Many superpollutants also have short atmospheric life-times. Superpollutant emissions are responsible for about 35–50% of observed warming to date, and their mitigation helps limit near-term peak warming.[1]

There is a broad range of superpollutant project categories on the VCM. However, certain project types dominated overall issuances in 2025; hydrofluorocarbon (HFC) replacement in foam production (~18%), landfill methane (~17%), and leak detection and repair in gas systems (~12%). While multiple analyses have highlighted the high quality of some superpollutant categories, over half still fall into lower-quality tiers, underscoring the need for careful due diligence in procurement decisions.

In 2025, projects reducing or avoiding emissions from superpollutants represented roughly 20% of issuances on the VCM. This is an increase from 2020 when it was only 11%. While issuances increased by about 180% between 2020 and 2025, retirements grew more modestly at roughly 150% (**figure 5**). However, recent announcements from prominent buyers such as Netflix, Google, and Workday; several Integrity Council for the Voluntary Carbon Market (ICVCM) approvals; and a newly endorsed landfill gas methodology under Article 6.4 of the Paris Agreement, suggest potential for a swell in interest in superpollutant credits. Growing interest in superpollutant credits will require rigorous technical analysis and tailored strategies for buyers to navigate diverse credit types and achieve their climate goals. Carbon Direct will soon release guidance for corporate buyers on how to integrate superpollutant mitigation into their broader climate plans.

1 Carbon Direct calculated the observed warming range using the IPCC's radiative forcing studies that evaluated emissions contribution on warming from 2010–2019 relative to 1850–1900. The original ranges were broken down by individual gases, but we combined into CO_2 and non-CO_2 for the range analysis. The high and low ranges for each gas were combined to find the percent contribution of non-CO_2 to observed warming. The ranges we used were: CO_2 [0.52–1.25°C]; for methane (CH_4) [0.29–0.84°C]; for nitrous oxide (N_2O) [0.05–0.16°C] and for F-gases [0.01–0.20°C].

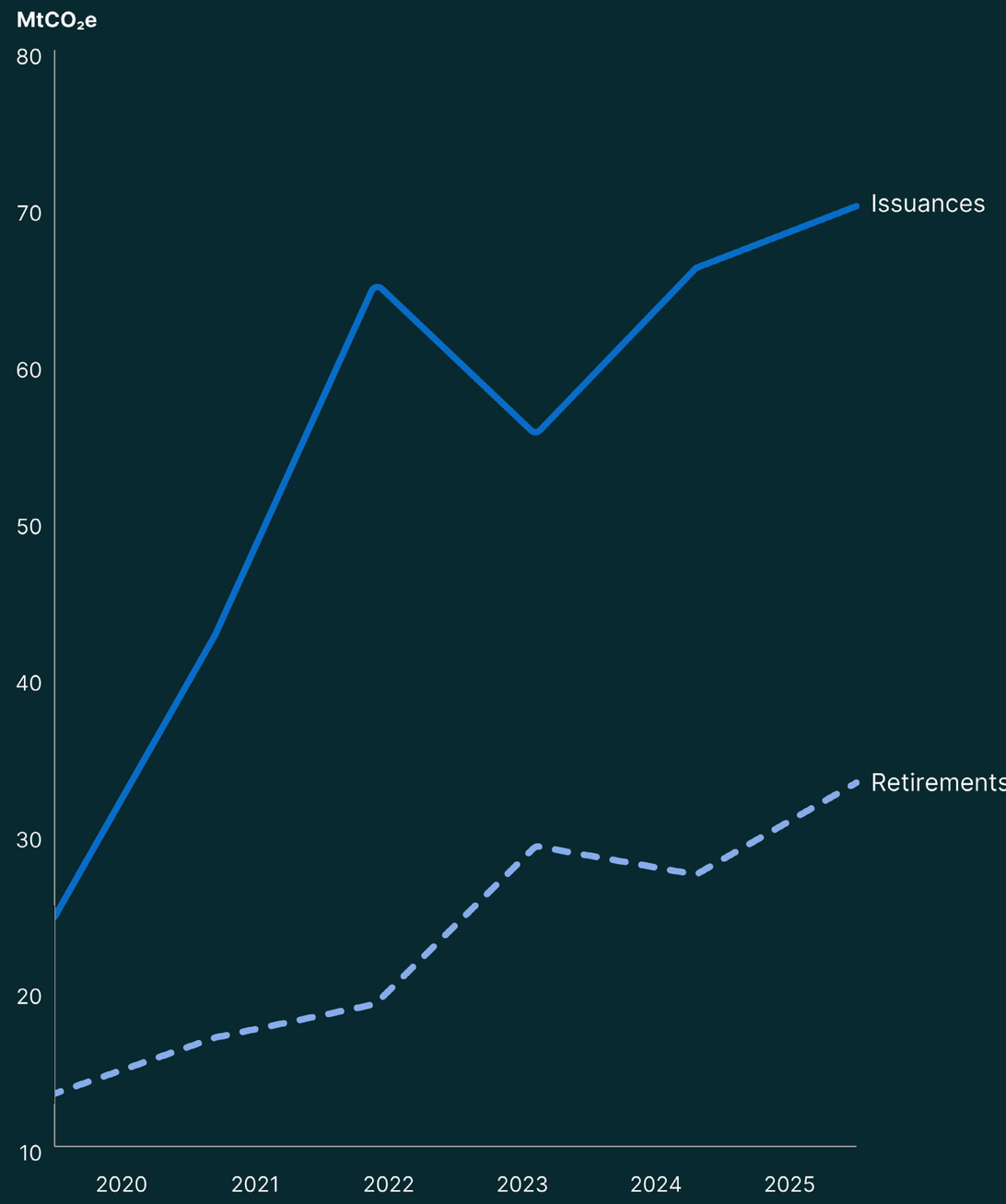
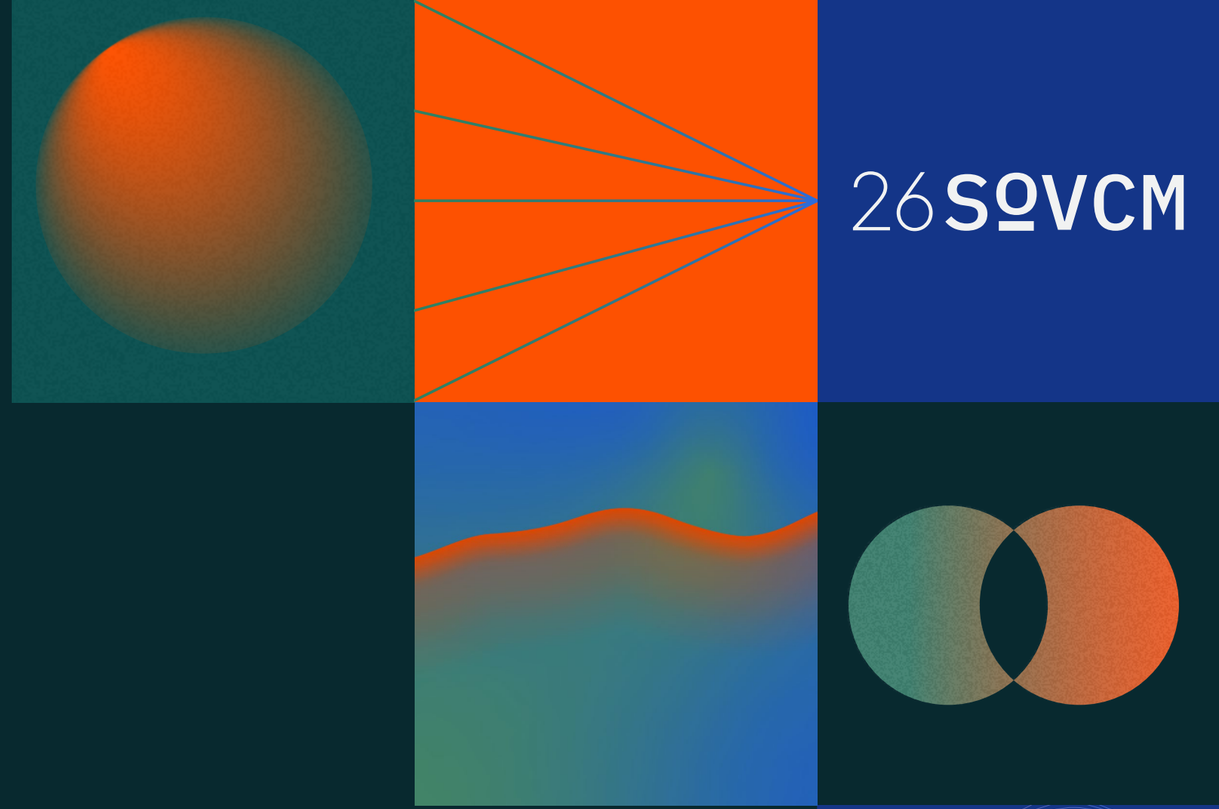


Figure 5. Annual superpollutant credit issuances and retirements between 2020 and 2025. Source: Carbon Direct, using data extracted from five major registries (i.e., Climate Action Reserve, American Carbon Registry, Gold Standard, Verra, and ART-TREES). Note: $MtCO_2e$ = megatonnes of carbon dioxide equivalent.



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The CDR spot market is dominated by nature-based pathways

In 2025, CDR credits accounted for about 6% of all credit issuances in the VCM, similar to levels observed in 2024. Of CDR issuances, 95% originated from nature-based CDR pathways, while 5% represented high-durability CDR pathways such as biochar or **direct air capture (DAC)**. This distribution reflects the mature role that nature-based CDR projects continue to play in the market, alongside the early stage of durable CDR deployment. Overall, spot-market retirements of CDR credits have remained steady.

Within nature-based credits, supply and demand dynamics differed between ARR and **improved forest management (IFM)**. For ARR credits, issuances and retirements have tracked closely at a roughly 1:1 ratio, with issuances remaining flat at around 7–8 Mt annually over the past four years, leaving little inventory available for spot purchasing and reflecting tight supply rather than weakening demand. Development timelines for ARR projects are long and create a lag between buyer interest and when new credits come online. As a result, ARR retirements in 2025 have not exceeded 2024 levels.

IFM credits, by contrast, have shown steady growth. Shorter project timelines and a more consistent flow of supply have enabled reliable year-on-year increases in issuances and retirements, making IFM one of the largest sources of growth within nature-based credits. However, IFM credits have generally remained oversupplied, largely driven by rapid generation of harvest-avoidance credits. CDR credits from IFM are typically in lower supply.

Since 2023, IFM retirements have increased

2.5X

Nature-based offtakes and commitments have expanded in recent years, reflecting buyers' efforts to secure future supply. Currently, there are more than 90 Mt of future delivery now contracted (**figure 6**). The vast majority of these commitments are concentrated in ARR projects, highlighting both the severe supply constraints facing ARR today and buyers' willingness to use forward offtake agreements to help scale high-quality, nature-based credits. ARR projects also rely on long development timelines and only begin generating revenue several years after project initiation. This makes forward offtakes essential for signaling future demand and enabling early-stage financing. While these contracted volumes are spread across a 10–20 year duration, typical of nature-based offtake agreements, they still imply annual future ARR deliveries that are more than 50% higher than today's spot-market retirements.

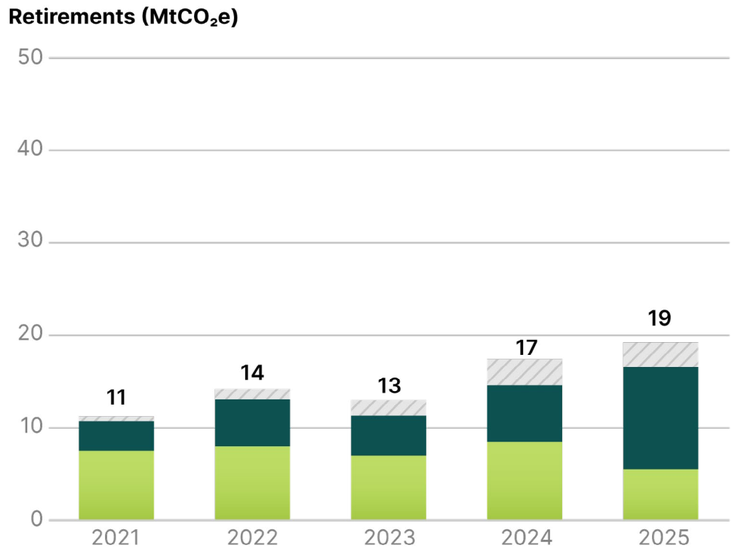


Figure 6. Retirements of nature-based carbon credits and forward offtake agreements and commitments, from 2021 to 2025, in million metric tonnes of carbon dioxide ($MtCO_2$). Data reflect all retirements across the five largest registries and Puro.earth, including reductions, not exclusively retirements from CDR credits. Forward offtake and commitment volumes are from the Carbon Direct proprietary tracker, which records deals starting in 2023. Note: ARR = afforestation, reforestation, and revegetation, IFM = improved forest management. Other includes categories such as soil carbon and sustainable grassland management
Source: Carbon Direct.

High-durability CDR demand is almost entirely forward looking

The spot market for high-durability CDR credits represents only 0.3% of activity in the VCM, but important dynamics are beginning to emerge as more high-durability CDR technologies reach the market.

Across high-durability CDR, the market remains concentrated in a small number of pathways. From 2021–2025, roughly 80% of issuances and retirements came from biochar and geologic storage, and overall retirements of high-durability CDR credits grew five-fold between 2023 and 2025. However, the emergence of large-scale **geologic CDR** projects is beginning to shift the balance, with individual projects capable of delivering hundreds of thousands of tonnes annually—volumes comparable to today's entire global biochar market.

Beyond biomass-based pathways, the high-durability CDR landscape is beginning to diversify technologically. Early-stage methodologies such as **enhanced rock weathering (ERW)** and **ocean alkalinity enhancement (OAE)** issued their first credits in 2025, totaling roughly 12,000 tonnes. While these volumes are modest, they mark an important milestone in broadening the high-durability CDR market.

While the spot market for high-durability CDR is growing and diversifying, forward offtake agreements continue to define the high-durability landscape. These contracts represent the vast majority of high-durability demand today and remain critical for enabling large-scale project development. Biomass-based pathways have dominated this forward market in recent years, and accounted for more than 95% of all high-durability volumes contracted through forward offtakes in 2025 (**figure 7**). Forward offtake agreement volumes are spread across the full duration of these agreements, typically 10–15 years for high-durability CDR. However, even on an annualized basis, they signal future demand that is an order of magnitude higher than current spot-market activity.

The ratio of high-durability spot retirements to volumes committed through forward offtake is

1:70

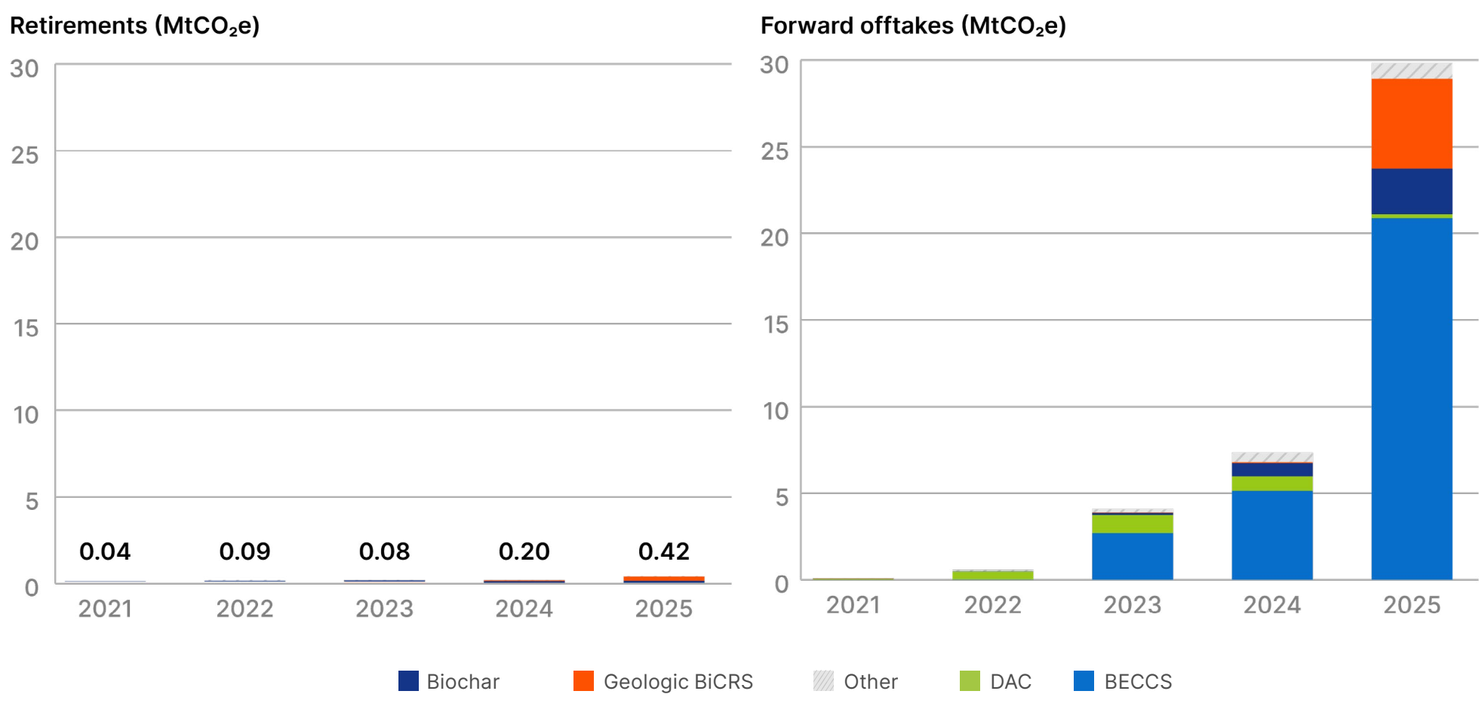


Figure 7. Retirements and forward offtake agreements for high-durability CDR credits across the five largest registries and Puro.earth, from 2021 to 2025, in million metric tonnes (Mt). Note: BECCS = bioenergy with carbon capture and storage, BiCRS = biomass carbon removal and storage, DAC = direct air capture, "Other" includes categories such as enhanced rock weathering and ocean-based solutions.. Source: Carbon Direct, with data on forward offtake agreements provided by CDR.fyi under license.

Forward offtake commitments are rising across CDR pathways

Forward offtake commitments for CDR have expanded rapidly over the past few years, signaling growing buyer willingness to secure future supply ahead of large-scale project deployment. To date, forward offtake agreements, **advanced market commitments (AMC)**, and large contracted deals with intermediaries cover more than 40 Mt of high-durability CDR, in addition to over 90 Mt of nature-based CDR. These cumulative volumes highlight the increasingly central role of forward purchasing in shaping future supply, particularly for capital-intensive, high-durability pathways.

A small group of companies continues to drive the majority of forward offtake activity. In 2025, Microsoft remained the clear market leader, accounting for roughly 60% of contracted nature-based CDR offtakes and more than 80% of high-durability offtakes announced to date.[2] Other active buyers—including Google, JPMorgan Chase, Equinor, and Amazon—have expanded their commitments, but overall market concentration remains high. In high-durability CDR, only 11 offtake agreements exceed 1 Mt. All 11 were signed by Microsoft, representing nearly 80% of total contracted high-durability CDR volume. A similar pattern appears in nature-based CDR, where a handful of large deals account for a substantial portion of total contracted volume.

While the increasing prevalence of forward offtakes is a promising development (**figure 8**), these agreements do not guarantee that developers will secure the necessary capital to implement their projects. For engineered CDR, **bankability** depends on contract structure, not just headline tonnage. Payment certainty, buyer diversification (i.e., including commitments from multiple buyers), multi-year offtake timelines, and well-designed sunset clauses are essential to support final investment decisions and get projects operational to deliver tonnes.

Many CDR projects have advanced significantly because of long-term commitments from anchor buyers. For large projects, durable CDR offtakes should span at least 10–15 years to address the core financing problems that high capital-intensive projects create and provide long-term revenue certainty.[3] Most of these projects target delivery by 2030 or earlier, aligning with buyers' interim climate targets. Nature-based CDR offtakes, by contrast, can extend beyond 20 years, reflecting the maturity of ARR and IFM project development.

Overall, forward offtake has become one of the strongest signals of future CDR market growth: highly concentrated today, but increasingly central to enabling the next generation of CDR supply.

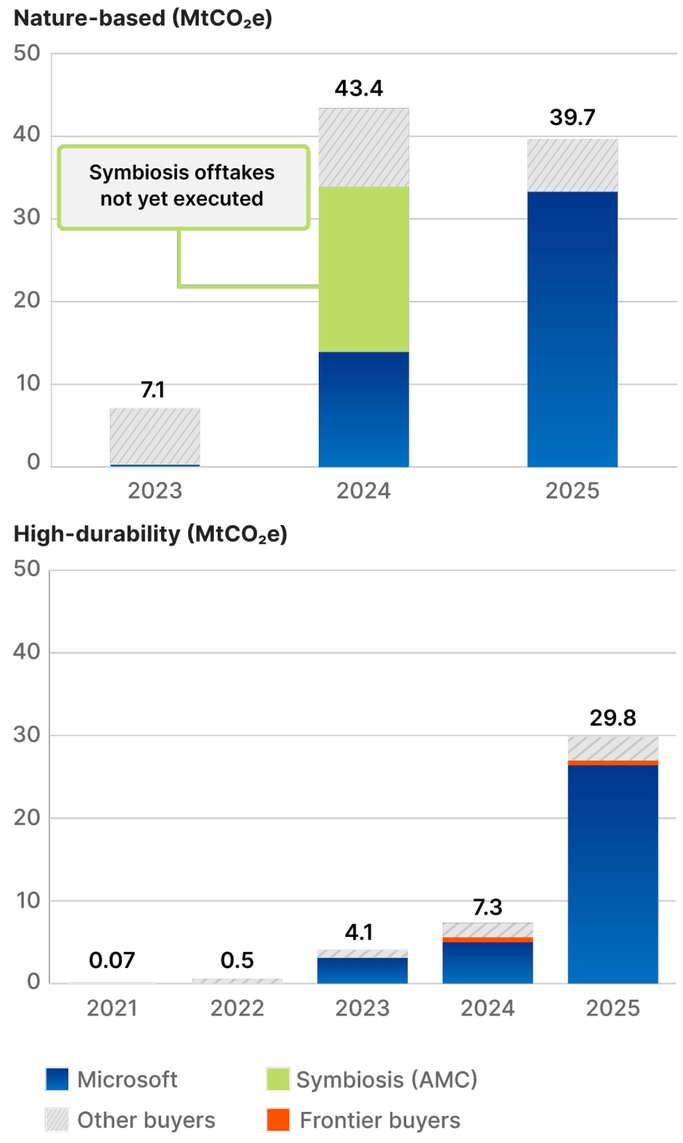


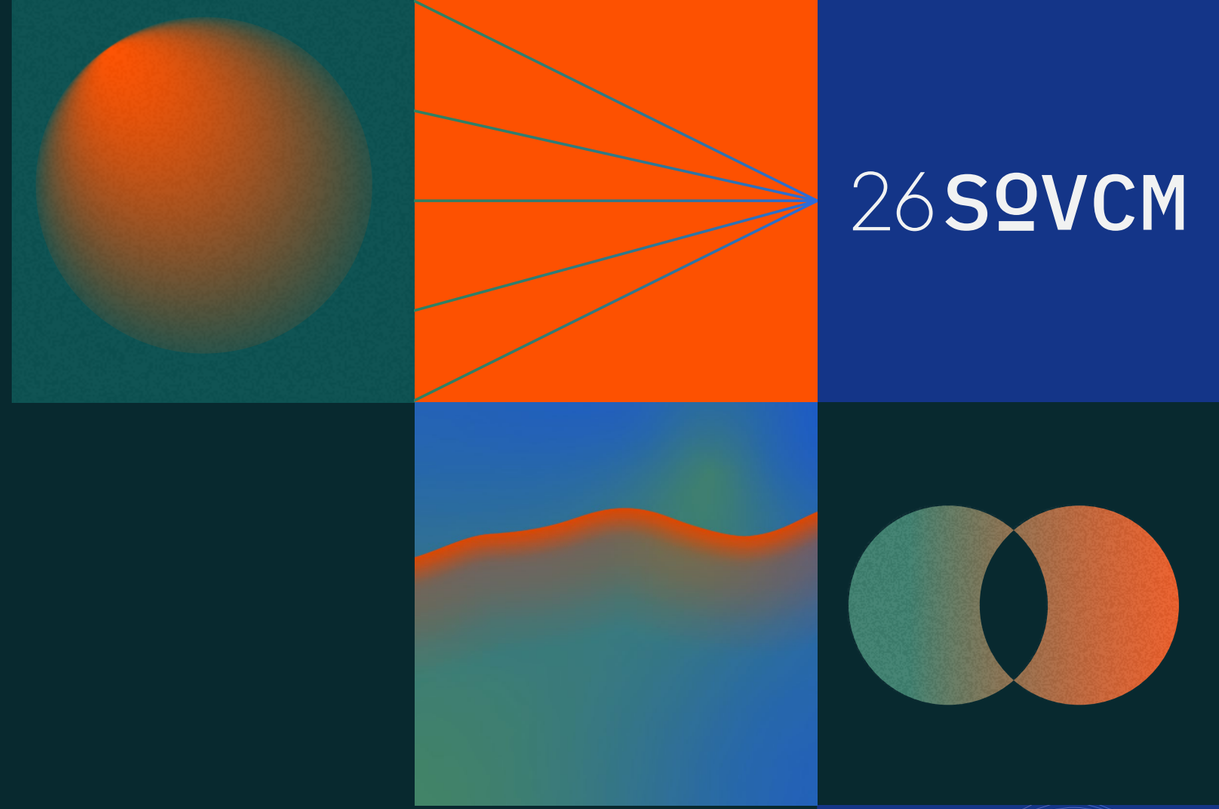
Figure 8. Offtake agreements and future volumetric commitments for nature-based and high-durability CDR credits, from 2021 to 2025, in million metric tonnes of carbon dioxide ($MtCO_2$). Note: AMC = advanced market commitment. Offtakes from Symbiosis have not yet been executed. Sources: Carbon Direct, using our proprietary tracker for nature-based offtake and commitment volumes, which records deals starting in 2023, and data on high-durability offtake from CDR.fyi, under license.

70%

of CDR offtakes announced to date are by Microsoft.

2 Excluding advanced market commitments (e.g. Symbiosis) and contracted deals with intermediaries.

3 A sufficiently de-risked facility has no major technical or regulatory barriers and sufficient commercial support, through offtake and project investment, to encourage additional investment and offtake from parties with a lower risk tolerance, such as debt providers.



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A market for two gigatonnes of CDR by 2050?

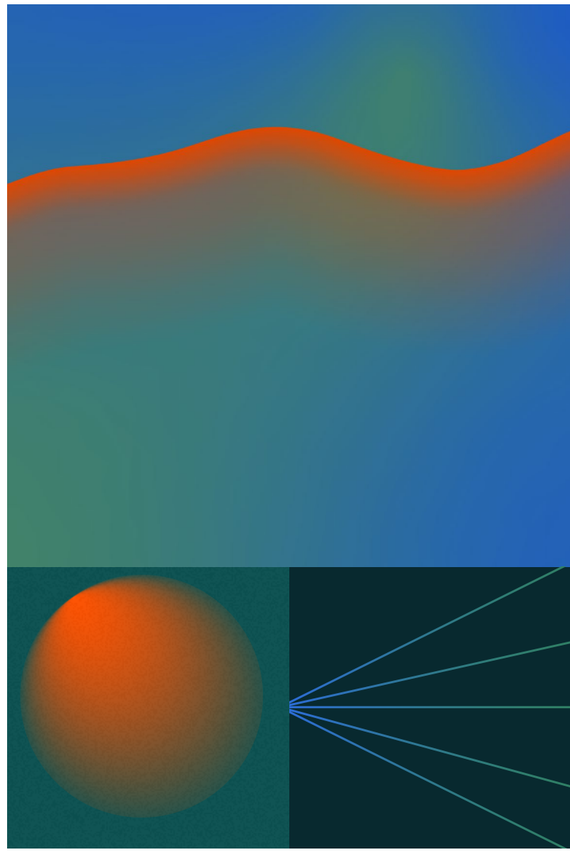
Forecasted CDR demand in the VCM remains inherently uncertain. Shifting standards and rapidly evolving market dynamics make it hard to predict how demand will materialize. Corporate climate targets anchor most current VCM activity: All of the top-10 buyers in the market today participate based on either self-declared commitments or net-zero commitments aligned with the Science Based Targets initiative (SBTi).[4,5] As a result, publicly shared targets offer the clearest window into how buyers plan to engage with CDR in the VCM. Long-term demand forecasts often extrapolate from the targets companies set today. This approach has limitations, but it still captures meaningful signals about future purchasing behavior. Demand forecasts based on these future commitments (i.e., target-led forecasts) project that total CDR demand could reach 620–780 Mt by 2040, a ~74-93x growth from today.

If today's top buyers adhere to their targets, CDR demand in 2030 could reach a minimum of

28 Mt

Yet, how companies decide to implement their targets will ultimately affect the composition of CDR demand within the VCM. If adoption of the Oxford Principles prevails and companies conclude that only high-durability CDR credits are appropriate for procurementby mid-century, following the like-for-like approach, demand for high-durability CDR credits could reach roughly 370–460 Mt by 2040 (see Methods). If buyers instead take a market-led approach focused on balanced portfolios driven by cost and availability, referred to as the portfolio approach, demand could reach about 160–190 Mt by 2040 (**figure 9**).[6]

However, these target-led, long-range forecasts remain highly speculative. Rather than relying solely on public commitments to infer future demand, Carbon Direct analyzed the behavior of companies that are actively purchasing CDR today. By extrapolating demand from this current buyer cohort, we made a forecast led by observed buyer activity taking an action-led approach, and identified a conservative demand floor for 2030. Should today's top buyers follow through on their stated CDR commitments, CDR demand could reach a minimum of 28 Mt by 2030, with 6.5 Mt of demand for high-durability CDR.



4 The top-10 corporate buyers are identified based on cumulative high-durability CDR volumes from 2023 to October 2025, including both forward offtake and spot market transactions. Source: CDR.fyi

5 The Science Based Targets initiative (SBTi) is an organization that reviews and approves companies' climate targets to ensure they are credible and aligned with global climate goals.

6 This section represents data resulting from Carbon Direct analysis, adapted from MSCI. (Certain information ©2025 MSCI ESG Research LLC. Reproduced by permission.)

If companies adhere to their targets, CDR is projected to reach from 1.6-2+ Gt by mid-century.

Low scenario demand volume (billion metric tonnes CO_2)

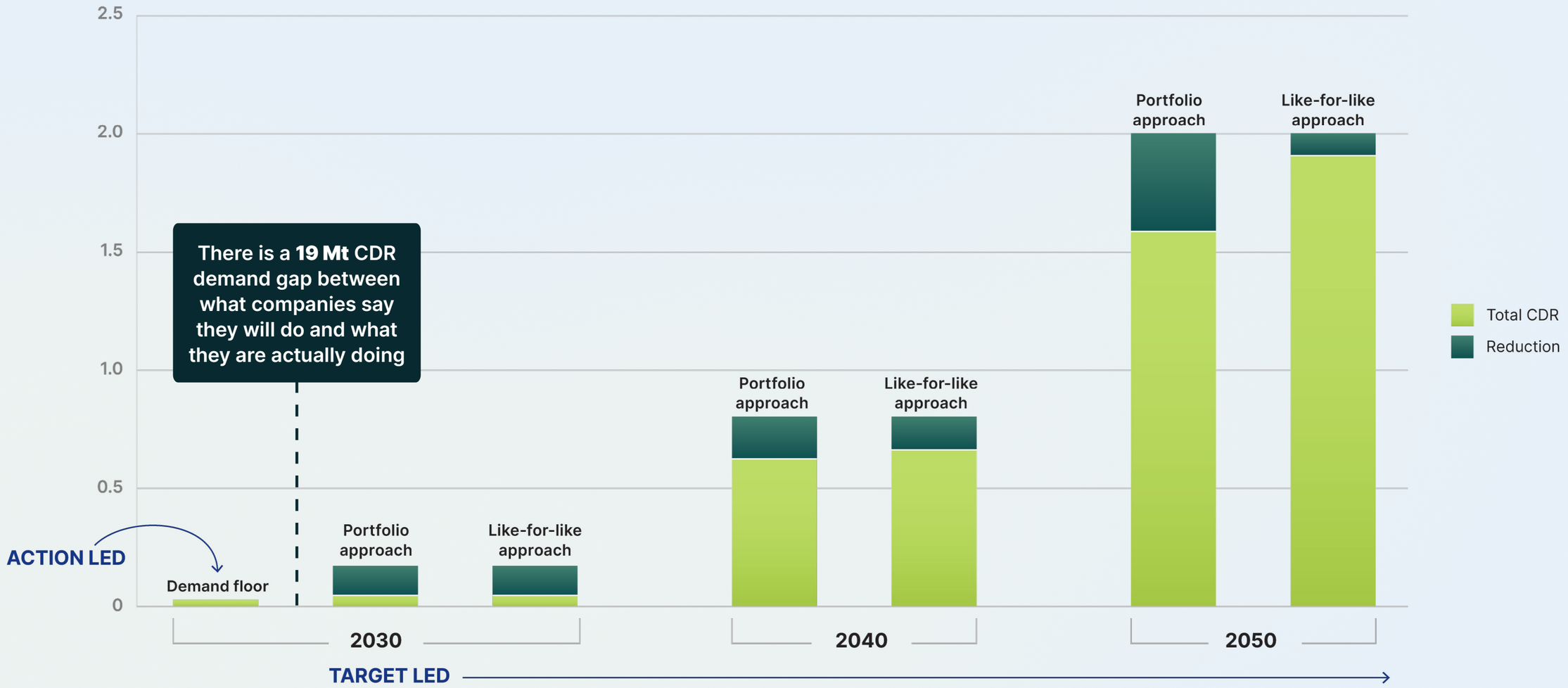


Figure 9. Comparison of the projected credit demand under the like-for-like and portfolio approaches, from 2030 to 2050, under a Low Scenario, in in billion metric tonnes of carbon dioxide (CO_2). In the absence of concrete 2030 requirements under the Science Based Targets initiative (SBTi) Corporate Net-Zero Standard (version 2, from November 2025), 2030 SBTi estimates under the Low Scenario assume that no companies will take the optional Recognized Status or Leadership Status approach, thus volumes are 0. Our action-led assessment demand floor is included for comparison. See the Methods section for more information on these projections. Source: Carbon Direct, adapted from MSCI data (Certain information ©2025 MSCI ESG Research LLC. Reproduced by permission).

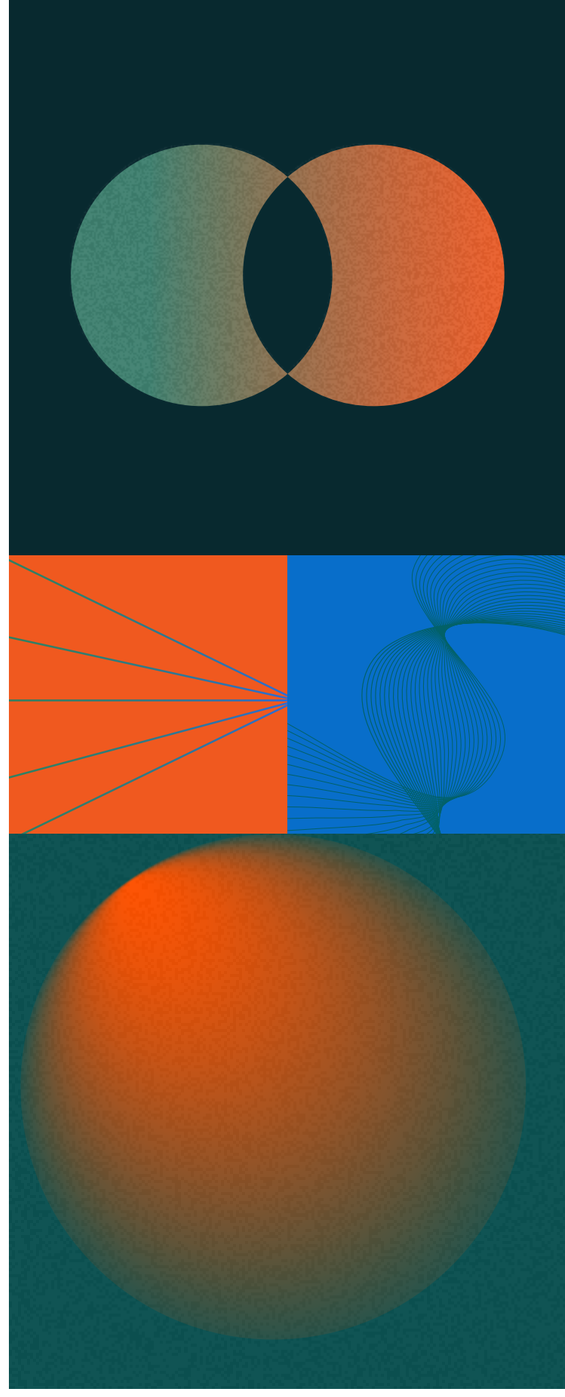
Target setting matters, but acting on those targets matters more

Corporate climate ambition continues to expand, even amid political headwinds and policy uncertainty. SBTi reported a 227% surge in companies setting both near-term and net-zero targets in the 18 months leading up to mid-2025. Recent analysis of CDP disclosures[7] shows the same pattern, with a nine-fold increase in companies reporting climate commitments over the past five years and 84% of firms maintaining or accelerating their decarbonization targets despite economic and political fluctuations. Standard-setting bodies are also tightening expectations in ways that reinforce long-term demand for high-integrity CDR. ISO 14068-1, published in 2023, clarifies how credible carbon markets—including CDR—can support residual, hard-to-abate emissions. SBTi's latest draft Corporate Net-Zero Standard (version 2, from November 2025) proposes stricter rules on scope 3 emissions accounting and clearer CDR targets, underscoring the centrality of CDR in credible net-zero pathways.

The discrepancy between observed demand and target-led scenarios shows a persistent gap between what companies say and what they do (**figure 9**). Shifting from intention to execution will ultimately determine whether the VCM evolves into a durable, functioning marketplace or stalls short of the scale required for credible, net-zero pathways.

If companies have science-aligned targets that rely on high-integrity CDR, they need to step off the sidelines and act now. Otherwise, the market risks a demand shock once commitments converge on implementation.

This could drive sharp price uncertainty and increase financial exposure for companies who delay procurement rather than locking in supply and pricing today.



7 CDP is a major reporting platform where companies share information about their environmental performance—similar to a financial disclosure system, but focused on climate and sustainability data.

SPOTLIGHT

SBTi could be a key catalyst for CDR demand

If the SBTi maintains its current trajectory, it is poised to become a central catalyst for CDR demand. Its latest draft Corporate Net-Zero Standard guidance (version 2, from November 2025), which expands neutralization requirements from scope 1 emissions to the full value chain, signals a meaningful and overdue shift toward CDR. This draft guidance requires companies to remove 1% of scope 1, scope 2, and scope 3 emissions by 2035 (17% of which must be high-durability CDR), linearly ramping up to 100% by 2050 (41% of which must be high-durability CDR). Under this draft, projected CDR demand rises to approximately 0.5 Gt by 2040 and more than 1.2 Gt by 2050 (**figure 10**).

Yet, the pace of this shift remains misaligned with the urgency required to build durable CDR supply. The SBTi's November draft guidance does not establish neutralization requirements until 2035. As a result, SBTi-aligned demand in 2030 remains uncertain.[8] This gap undermines the near-term market signals needed to mobilize capital, scale supply, and sustain momentum toward high-quality CDR.

The delay in credible demand signals carries tangible consequences for corporate procurement strategies. SBTi is moving toward substantial CDR requirements. However, these obligations will materialize after the market has already begun to tighten, and those who wait for formal requirements to procure CDR risk entering a crowded scramble for limited high-quality supply. Those who act early will secure a strategic advantage and reduce risk on cost and quality.

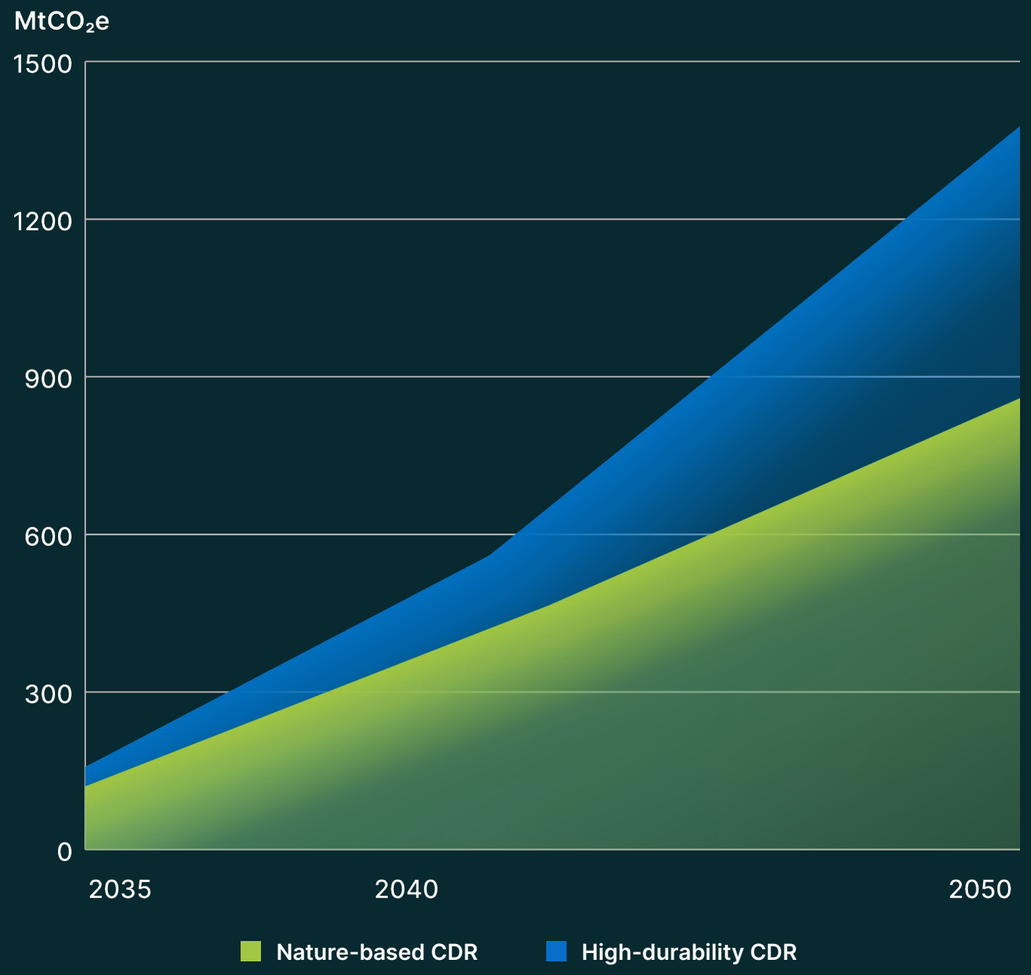


Figure 10. Science Based Targets initiative (SBTi) credit demand between 2035–2050, in millions of metric tonnes of carbon dioxide ($MtCO_2$), across SBTi net-zero committed or validated companies following minimum requirements under SBTi's latest draft Net-Zero Corporate Standard (version 2, from November 2025). Under this guidance, SBTi does not permit the use of reduction credits after 2035, thus this credit type is not represented here. Note: CDR = carbon dioxide removal. Source: Carbon Direct, adapted from MSCI data (Certain information ©2025 MSCI ESG Research LLC. Reproduced by permission).

8 The SBTi's optional Recognized status includes a "tonne-for-tonne" approach that requires companies to compensate for 1% of their full value chain emissions by 2030, with no requirements around the use of CDR versus avoidance credits.

Buyer risk appetite shapes CDR demand

Recent data reveals a trend where companies purchase carbon credits but deliberately choose not to publicly disclose these transactions. In the broader VCM, 55% of tonnes retired on the spot market over the past three years have been anonymous, and that fraction has been increasing (see Methods). A similar trend is true of high-durability CDR: nearly 40% of all offtake transactions made in 2025 did not disclose the participating buyer (see Methods). This buyer behaviour could reflect the often-discussed **greenhushing** phenomenon.

Risk appetite can be used as a conceptual framework for categorizing buyers in the VCM, providing an analogy for buyer behavior that helps us think about how demand materializes. Some buyers seek the catalytic impact and leadership status that comes with early action (e.g., early advance market commitment groups such as Frontier). Others take a more cautious approach, either investing in careful diligence and transparently publishing their criteria for high-quality projects (e.g., Microsoft and JPMC), or entering the market slowly to gain experience or capture emerging opportunities (e.g., MaRS Discovery, British Airways). A third group chooses not to participate at all, waiting on the sidelines for clearer permission or stronger signals before engaging. Finally, a less visible cohort chooses to engage in undisclosed activity, avoiding scrutiny while still exploring pathways to meet their climate goals.

While certain players aim to lower their own reputational or commercial risk through silence, they collectively raise systemic market risk. Although it's difficult to attribute specific motivations for non-disclosure, the result is the same: it muddies the market. When anonymous actors dominate, it becomes harder to track demand signals, verify corporate progress, and establish clear integrity benchmarks.

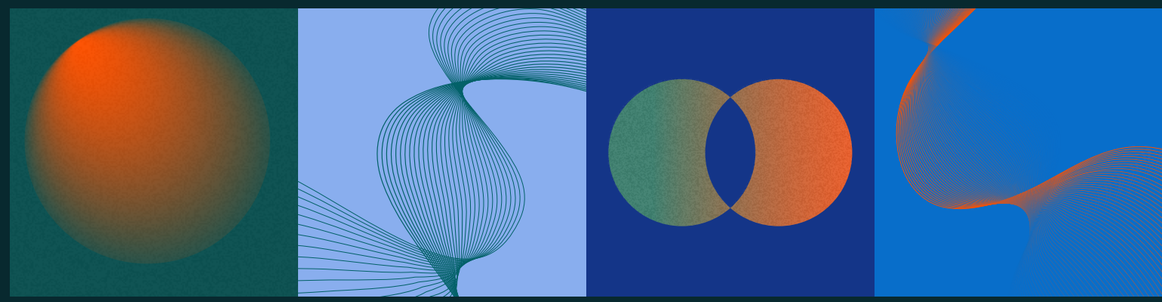
55%

of spot market tonnes were retired anonymously between 2023 and 2025.

SPOTLIGHT

The CDR market cannot wait for compliance

Although essential to the long-term evolution of a viable CDR sector, large-scale compliance market signals for CDR are unlikely to materialize before the end of this decade. Existing and proposed schemes treat CDR as optional, and substitutable for conventional allowances, meaning regulated entities will continue to choose the lowest-cost mitigation options available. As long as durable CDR remains more expensive than avoidance credits or emissions allowances, CDR procurement will remain limited. In addition, few countries have signaled a willingness to issue corresponding adjustments for CDR projects, a prerequisite for CORSIA eligibility. The European Union and United Kingdom have announced plans to integrate CDR into their emissions trading systems by 2030, potentially setting templates for other markets. However, meaningful regulatory demand will materialize only once CDR use is mandated or otherwise strongly incentivized. Voluntary corporate target-setting, whether formalized or self-declared, has been the primary engine of CDR activity to date and is likely to remain the critical driver of VCM demand through the early 2030s.



Approaching policies and standards could tip the VCM into its next phase

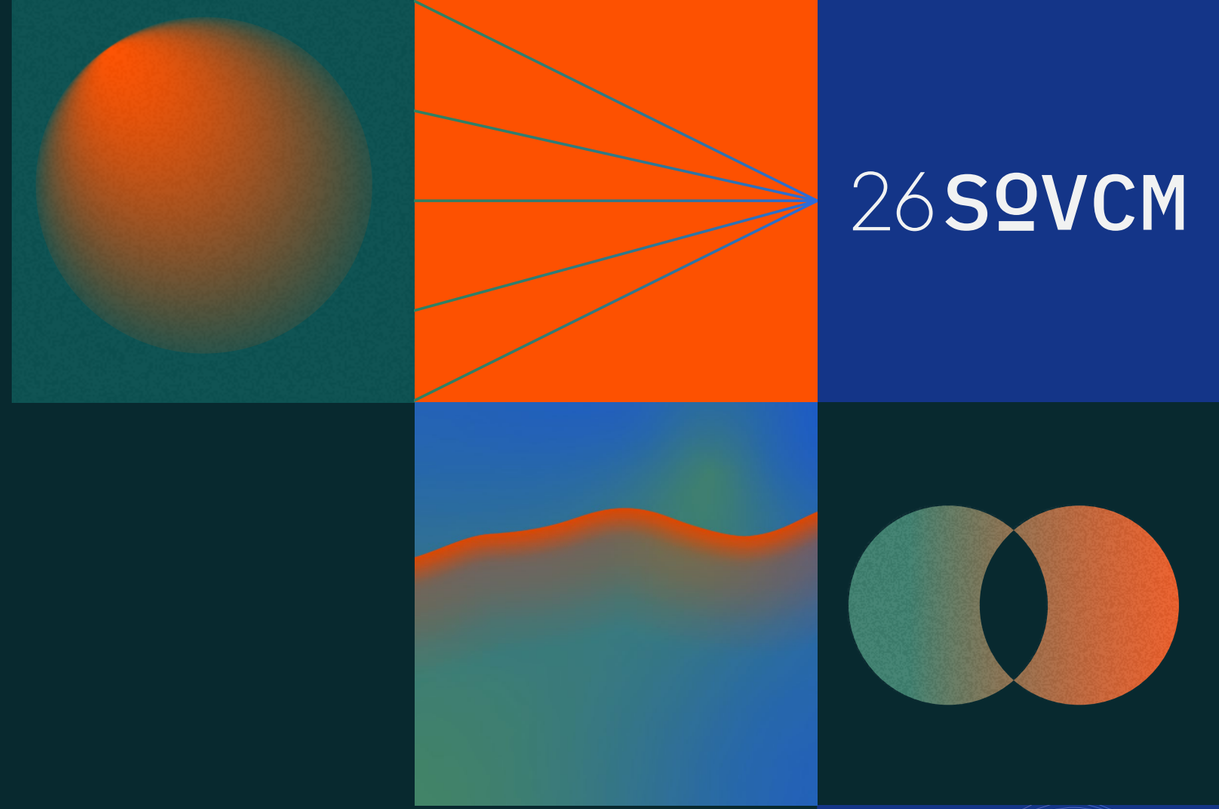
After half a decade of level market activity, there are several pivotal events on the horizon that could have a meaningful impact on the VCM. These events, by mitigating risk or unlocking significant project development, could tip additional buyers into action. Tipping points are defined as a series of cascading small changes which become significant enough to cause a larger more important change, such as spurring the VCM into the next phase of activity.

Table 1 summarizes possible tipping points; their impacts, significance, and relative certainty; their implementation timeline; and what we are tracking for each point.

Table 1. Policies and standards that could act as tipping points for the voluntary carbon market (VCM).

More significant/ certain ← → Less significant/ certain

Tipping point		Market impact	Significance	Certainty	Implementation timeline	What we're tracking
Voluntary demand	**CDR milestones in SBTi Corporate Net-Zero Standard, V2.0**	**DEMAND:** 10,000 companies and counting are signed up to SBTi and will be required to purchase CDR progressively to reach residual targets by their net-zero year.			Current draft considers milestones from 2035 onward.	Trajectory of signatories into 2026.
	Inclusion of CDR in revised ISO Net-Zero Standard	**DEMAND:** ISO has 175 national member bodies. If CDR is included in the revised net-zero standard for balancing residual emissions, this could be a significant demand driver.			2026 publication; typically 3–6 month certification	Whether the ISO standard is issued as a public resource (unusual); will be hampered by a lack of authorization from EU Green Claims Directive.
	Establishment of EU CRCF Buyers' Club	**DEMAND:** Buyers' Club incentives, such as collective diligence and risk underwriting facilitate early CRCF demand to help bridge period before integration into EU ETS.			2026 onward	Whether the incentives offered to buyers are attractive enough to crowd in private investment, especially without significant EU co-financing.
Compliance demand	**Inclusion of CDR in UK SAF mandate**	**DEMAND:** Would be the first example of formally introducing CDR into an SAF mitigation scheme, which could be a signal for other national roadmaps and policies.			Unknown	Regulatory implementation of the UK GGR report; still only a guidance document.
	Inclusion of CDR in national ETS schemes	**DEMAND:** Compliance CDR volumes will be shaped by the relative cost of CDR units compared to traditional ETS allowances.			2026–2040	Findings of ETS assessment report due by July 2026; merging of UK and EU ETS and any alignment of rules.
Regulatory support for supply	**Loosening of CORSIA credit supply bottleneck via LoAs**	**SUPPLY:** Authorization of correspondingly adjusted CDR credits unlocks the CORSIA market, but CDR demand may be minimal given the price differential.			2026 onward	Whether sufficient LoAs are issued to satisfy CORSIA and NDC demand, and how much authorized supply is CDR.
	Publication of Article 6.4 methodologies	**SUPPLY:** The availability of CDR projects adhering to globally negotiated standards and methodologies approved by the UNFCCC Supervisory Body could enhance buyer confidence.			2026 onward	Whether new CDR methodologies are finalized in 2026; unlikely, as the expert group agenda suggests avoidance methodologies will be developed first.
Other	**CO_2 transport and storage infrastructure proof of concept**	**SUPPLY:** The proof of concept and evidence of modularization could unlock storage capacity and offtake for key regions.			2028 onward	Flow of funding into US and Asian CCS clusters; successful transition of Northern Lights into Phase 2 (tripling capacity) in 2028.



SECTIONS

More investment is needed in nature-based CDR supply to support targets

Carbon Direct forecasts up to 32 Mt per year in **nature-based CDR** issuances in 2030, based on current finance for nature-based CDR projects. This level of supply, the most generous of our supply model scenarios, is sufficient to meet Carbon Direct's most conservative demand floor estimate, which projects 21 Mt of demand for nature-based CDR in 2030, representing the current purchasing practices of historical nature-based CDR buyers without any new market entrants.

However, this supply is significantly below the 40-90 Mt of nature-based CDR demand predicted in Carbon Direct's low to medium target-led demand models, which represent demand from companies with public, voluntary decarbonization targets and CORSIA (**figure 11**). Nature-based CDR would therefore require a 30–220% increase in finance to support current corporate targets that are aligned to the Oxford Principles.

Historically, this capital has come from natured-based CDR project investment funds. In order to bring nature-based CDR projects to market, developers require capital to de-risk initial project operations (e.g., nursery care and tree planting). To model future nature-based CDR supply, Carbon Direct aggregates finance announcements for nature-based CDR funds and project investments by fund type (e.g., funds dedicated to Brazilian ARR versus funds for North American IFM). We then divide each type by our proprietary **de-risking** costs, which represent a minimum per-credit investment required to bring a project online (see Methods).

Carbon Direct has identified US$18 billion in publicly committed funds for nature-based CDR announced from 2018 to 2025. If deployed immediately to generate high-quality CDR, this level of funding could translate into up to 32 Mt per year by 2030 and 290 Mt cumulatively through 2040 (**figure 12**).

Potential nature-based CDR supply in 2030 based on current project finance: up to

32 Mt

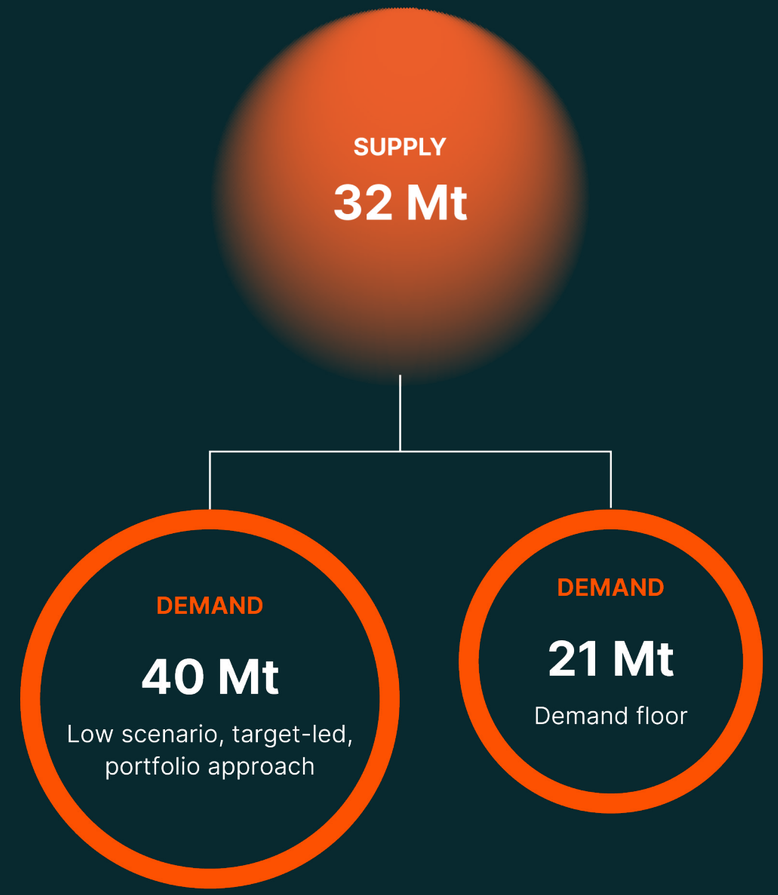
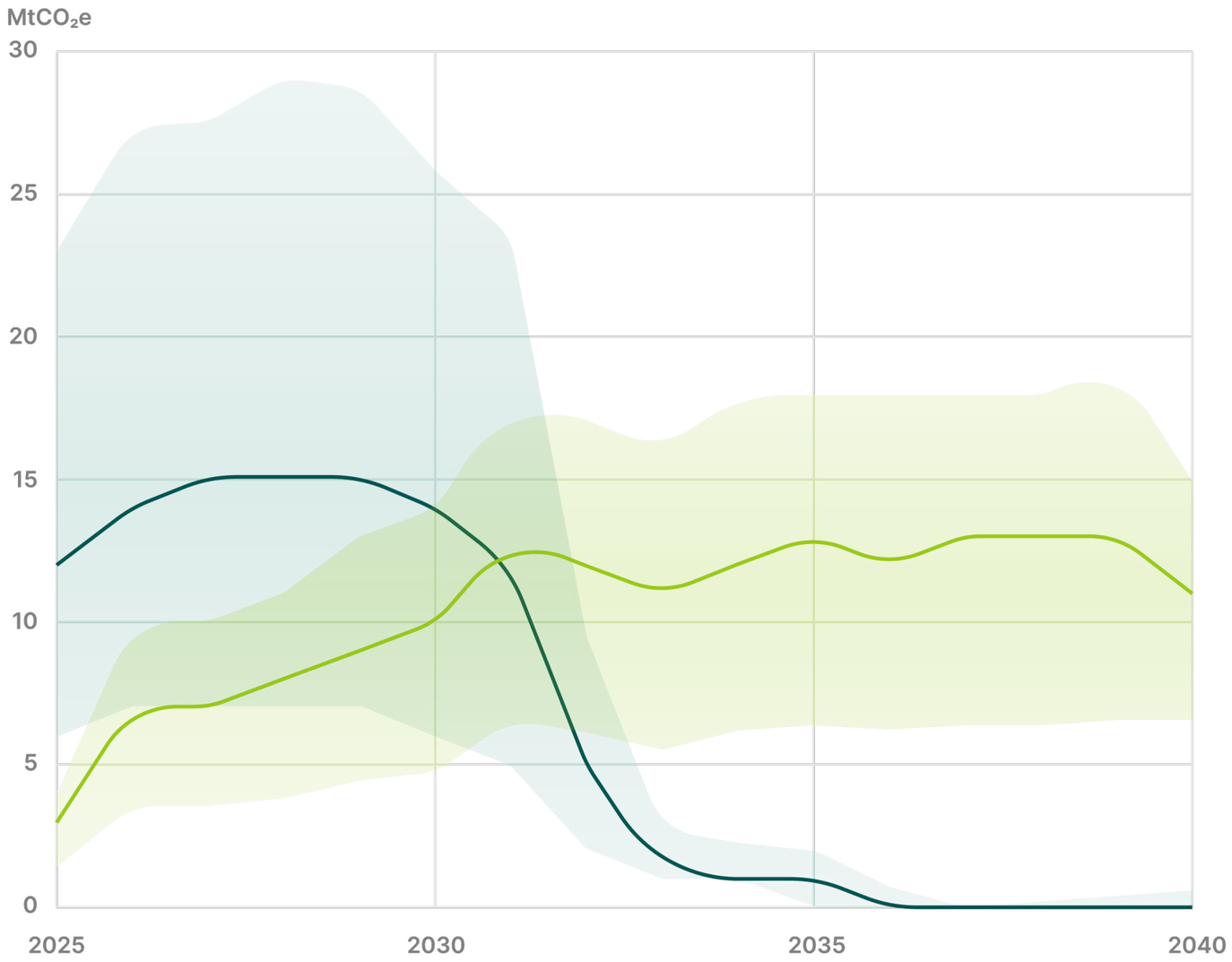
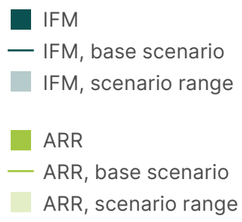


Figure 11. Projected 2030 nature-based CDR credit supply and demand scenarios. Source: Carbon Direct.





Note that this supply projection is a snapshot of current finance available in 2025, calibrated for comparison with demand up to 2030. For 2030 and beyond, CDR supply will depend primarily on future capital inflows, and CDR decision-makers should be aware of several key dynamics:

- **ARR credits may remain undersupplied:** ARR projects generally issue their first credits between the third and fifth year of project operations. Projects commencing operations in 2025 may not generate meaningful credits until after 2030.
- **Continued IFM investment is a critical nature-based CDR supply lever:** While ARR project issuances grow steadily throughout the project life-time, IFM project issuances grow rapidly following project initiation, and peak after approximately five years. IFM projects can therefore scale quickly to meet demand, but require continual investment to provide consistent supply.
- **Cost of capital has a large influence on per-credit price:** Nature-based CDR project finance currently relies primarily on private capital providers with relatively high return-on-investment expectations. Accessing lower cost-of-capital through non-dilutive funding and debt will be crucial to lowering the de-risking cost of future nature-based CDR supply.

Figure 12. Projected new, nature-based CDR supply originating from 2025 capital allocations across three scenarios, in millions of metric tonnes of carbon dioxide ($MtCO_2$). In generalized CDR credit yield curves, IFM projects issue more credits in a project's initial years, whereas ARR projects take more time to ramp up credit generation. Note: ARR = afforestation, reforestation, and revegetation, IFM = improved forest management. Source: Carbon Direct.

Most planned high-durability CDR will not commence operation without additional offtake

Carbon Direct estimates that the total pipeline of techno-economically feasible CDR pathways, with storage in geologic formations, could increase from less than 1 Mt of total credit capacity per year in 2025 to 30 Mt per year by 2030 (**figure 13**).[9]

Two overarching market dynamics have defined the high-durability CDR market outlook over the past year:

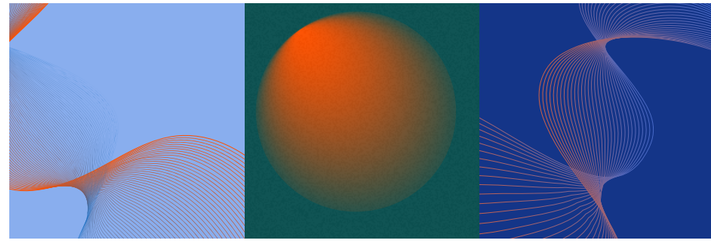
- First, potential DAC capacity has decreased by roughly 40% to under 6 Mt per year in 2030. This change is due to many factors, but driven primarily by the potential cancellation of US$3.5 billion allocated to the United States Regional DAC Hubs Program, low forward offtake, persistently high capture costs, and continued shortcomings in pilot and first commercial-scale facilities. Climeworks' first commercial facility, Orca, has operated at approximately one-third of its nameplate capacity.
- Second, potential geologic biomass carbon removal and storage (BiCRS) capacity has increased by roughly 5% to over 24 Mt in 2030.[10] This capacity is supported by rapidly increasing offtake, which reached 26 Mt in 2025, representing 320% growth over 2024 full-year values. This offtake has supported 18 suppliers, eight of which have signed contracts in both 2024 and 2025. The relatively low number of total suppliers receiving support, and the high share of follow-on offtake reflects a consolidated market landscape.

However, it is highly unlikely that all of this capacity will be built. We estimate that over 80% of the total 2030 pipeline is at risk, due to insufficient project offtake and financing agreements (see Methods).

Without increased offtake and financing support, we expect that the landscape for capital intensive, high-durability CDR may consolidate as suppliers deplete cash reserves, fail to secure additional offtake and funding, and ultimately become insolvent. If the pipeline for these commercial-scale facilities fails—particularly DAC and BiCRS technologies with multi-year permitting, design, engineering, and construction lead times—the CDR industry as a whole risks a "valley of death" scenario, whereby research, development, and venture capital funds are exhausted, but the sector cannot reach maturity to access conventional commercial financing. Under this paradigm, present-day suppliers would largely cease operations, and the high-durability CDR industry would lose several years of commercial progress toward providing gigatonne-scale supply.

>80%

of techno-economically feasible geologic BiCRS and DAC capacity is at risk.



9 Carbon Direct assesses techno-economic feasibility qualitatively and quantitatively across a set of techno-economic variables including front-end engineering design status, final investment decision status, offtake quantity, capital availability and funding, project siting, permitting status, regulatory risk, and business partnerships. Feasible projects are those that Carbon Direct's science team considers technically workable, and that could deliver given sufficient finance and offtake.

10 Geologic BiCRS includes all biomass-based CDR pathways with storage in geologic formations.

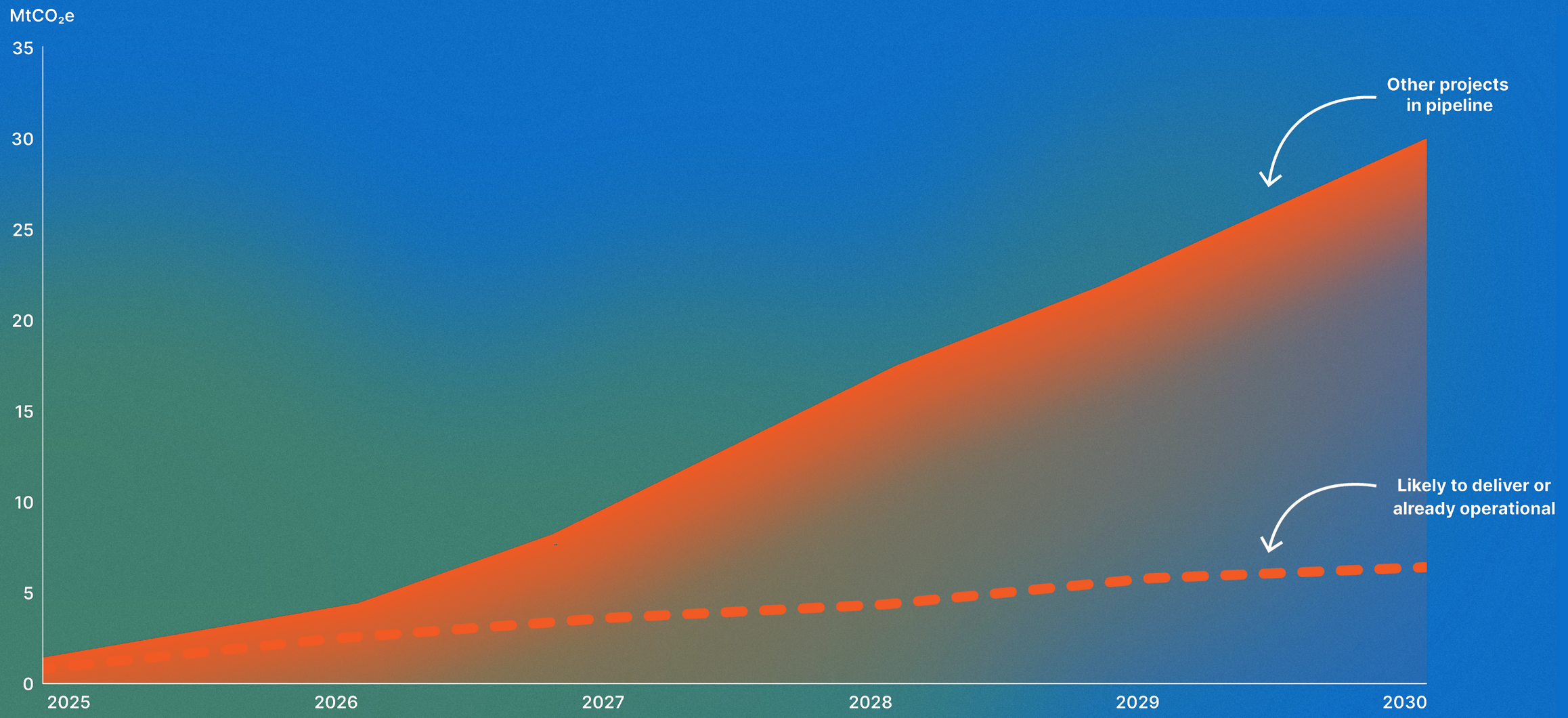
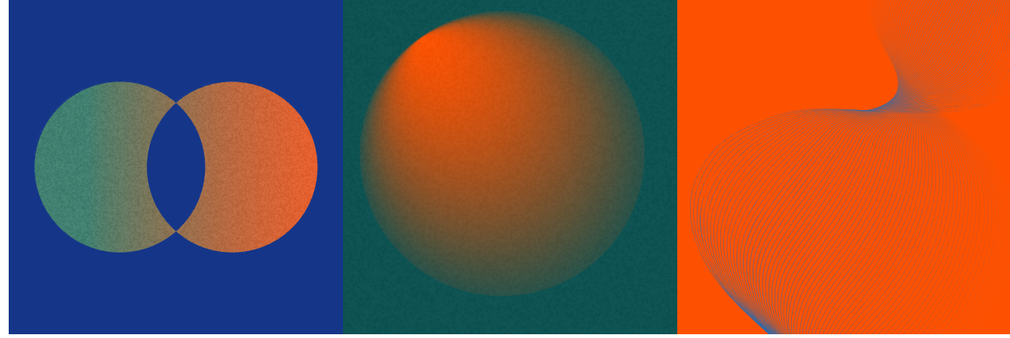


Figure 13. Pipeline capacity for high-durability CDR projects, 2025–2030. Note: Stacked areas show cumulative capacity for high-durability biomass carbon removal and storage (BiCRS, including BECCS, bio-oil injection, and ethanol with CCS) and direct air capture with geologic storage (DAC CCS). Highlighted percentage indicates the share of projects likely to deliver or already operational by 2030. Units in $MtCO_2$. Source: Carbon Direct.



Risks differ by CDR pathway and require tailored responses

Understanding how risks to project success differ by CDR pathway allows for tailored, demand-side support. **Table 2** provides a summary of some key challenges.

Table 2. Key challenges to CDR pathways

CDR pathway →	Nature-based CDR solutions	More modular hybrid and engineered CDR	Less modular hybrid and engineered CDR
CDR solution group	Improved forest management (IFM), afforestation, reforestation, and revegetation (ARR)	Biochar, biomass burial, enhanced rock weathering (ERW)	Direct air capture (DAC), biomass carbon removal and storage (BiCRS), with geologic storage
Challenges to delivering projects, specific to CDR solution	**Unrealistically high credit yield projections** challenge conservative financial underwriting **Low-quality projects** dominate the market and fail to deliver stated climate benefits	**Complex lifecycle accounting** for some methodologies may lead to credit yield and **durability** uncertainty	**High technical complexity** leads to uncertainty in delivery timeline, performance, and cost-to-deliver **High capacity, low modularity facilities** require large offtake and capital commitments **Regulatory burden** increases costs and timeline to deliver
Overarching challenges to delivering projects	**Insufficient regulatory support and CDR guidance** fails to incentivize broad market participation. CDR production under this dynamic is fundamentally a cost borne largely by private companies for a socialized benefit. **Unclear forward demand signals** prevent supply-side market actors from right-sizing their businesses to meet the scale of demand. A lack of public commitments to future CDR purchasing, regulatory whiplash, and greenhushing all contribute to this dynamic. **High capital costs** inflate required per-credit costs, reducing total demand for CDR as the price per tonne increases. **Time between project development and credit generation** often necessitates years of pre-operational spend with little or no revenue. This decreases supplier liquidity, necessitates relying on equity finance at a high cost-of-capital, and exposes suppliers to risks from unanticipated changes to the CDR market, regulatory landscape, and macroeconomic conditions.		

How buyers act today will determine which projects get built

Entering 2026, the CDR market is fragile. The supply-side ecosystem features a sufficient number of high quality-CDR suppliers with the potential to scale. These suppliers face purchasing behavior insufficient to meet buyers' own stated climate goals. While the market awaits clear standards and demand from compliance schemes, each purchasing decision matters. Buyers and investors can play a critical role in reducing project risk and strengthening the CDR market via the following actions:

1. **Use purchasing power wisely:** Recognize the balance between exploratory purchasing that supports small-scale, first-of-a-kind facilities built to demonstrate the technological viability of a CDR approach and committed offtake that brings large, commercial-scale facilities online.

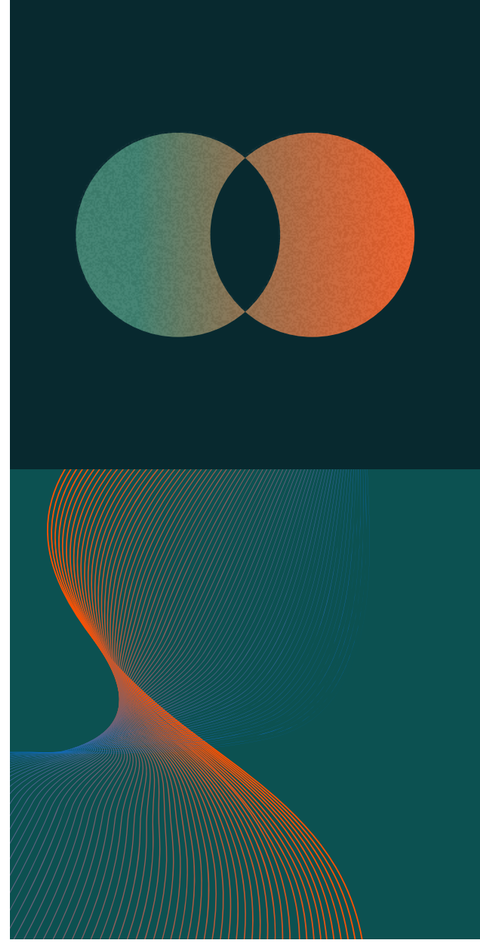
2. **Prioritize project diligence:** Conduct scientific, technical diligence to evaluate project strengths, weaknesses, opportunities, cost, and risks. Diligence should be tailored to match the size of the commitment. Rapid evaluations are more suitable for triaging project pipelines, while large multi-year offtakes and project investments may require iterative, deep investigations.

3. **Construct bankable contracts:** Design "bankable" offtake contracts that de-risk CDR projects and enable suppliers to access lower-cost capital. Aim to improve supplier liquidity (e.g., through upfront deposits) and increase the likelihood of project delivery.[11]

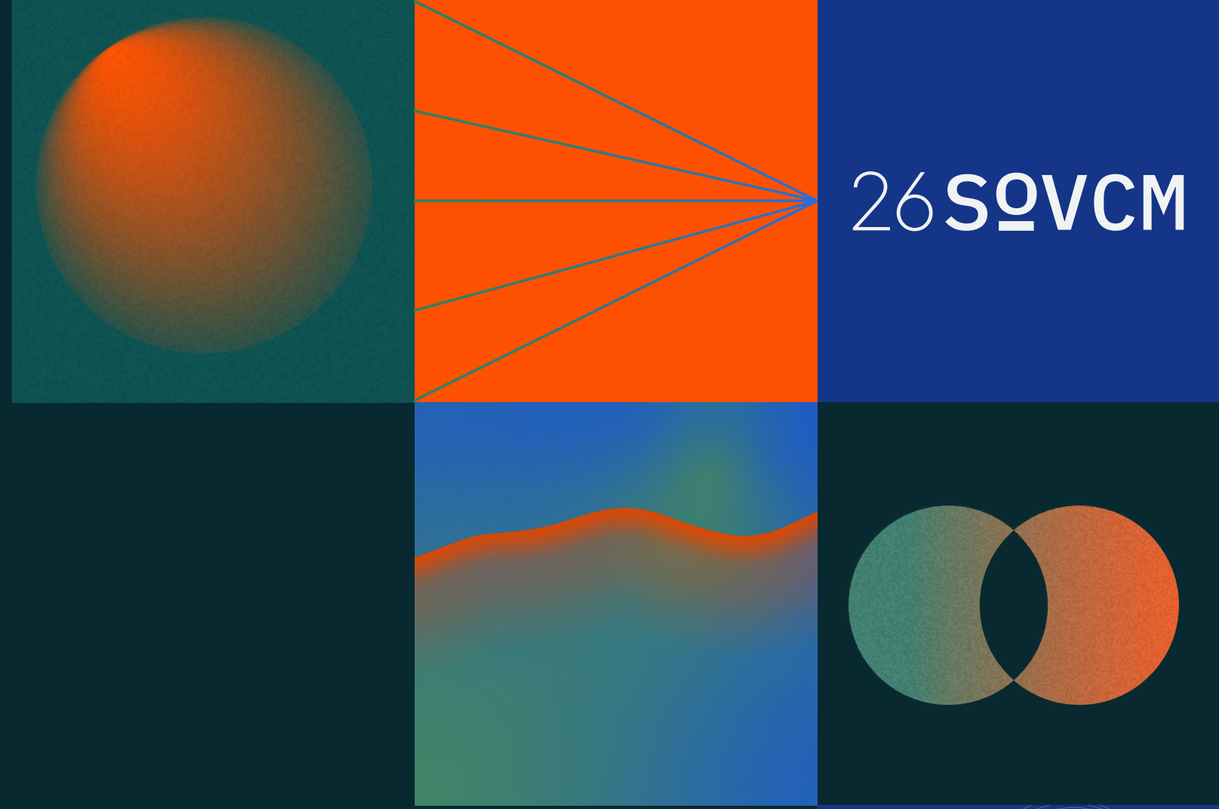
4. **Support market data transparency and CDR goals:** Disclose retirements on-registry, provide public indications regarding CDR purchasing and investment strategy to send a clear signal to suppliers, and facilitate the adoption of standardized definitions of project quality with methodological alignment.

5. **Undertake project assurance:** For major projects, consider independent, milestone-based project assurance to provide early identification of technical, commercial, governance, and delivery risks during project development. By leveraging milestone- and risk-based payment triggers, buyers and financiers can tie project finance to execution, increasing the likelihood of successful and timely commissioning.

Under this paradigm, buyers and investors decide which projects survive. Cumulatively, these decisions will determine whether the CDR market, which has transformed into a multi-billion, multi-megatonne industry in the last half-decade, scales to the gigatonne-levels required to meaningfully address climate change.



11 Bankable offtakes enable a developer to access lower cost-of-capital financing (e.g., debt financing, development finance institution capital, supplier prepayments, other non-dilutive capital) from financial institutions, in-turn reducing project costs and increasing delivery likelihood. Buyers can increase bankability through long-duration, high-volume forward CDR contracts.



SECTIONS

Demand forecasting methods

Buyer-led approach (observed buyer behavior)

To calculate the observed-buyer demand-floor for CDR credits in 2030, Carbon Direct reviewed the commitments of top active buyers in the CDR market.[12] We relied on the public disclosures of these companies exclusively on compensation and contribution carbon credit commitments that explicitly refer to CDR projects. Where companies do not state specific high-durability CDR procurement goals, we assume that 15% of their procurement for 2030 will be high-durability.

Target-led approach

To inform our analysis, Carbon Direct referenced data obtained from MSCI's Corporate Data module, where a bottom-up assessment evaluated over 13,000 companies and 400 individual airlines. These forecasted estimates were driven by four main demand pillars: voluntary corporate claims (including SBTi, self-declared net-zero claims, and carbon-neutral claims) and CORSIA. A company's future emissions are based on its specific climate targets and projected emissions. This analysis includes a range from a Low Scenario to Medium Scenario[13] as a base for the quantified demand forecasting presented here. This analysis implements the following methodology and assumptions:

SBTi's draft guidance on the Corporate Net-Zero Standard (version 2, from November 2025): Carbon Direct estimated potential SBTi-aligned demand for the updated draft guidance using MSCI projected emissions data for companies with SBTi net-zero commitments. We excluded companies with only near-term SBTi commitments from the core analysis. We applied emissions compensation percentages and credit preferences following the SBTi's draft guidance on the Corporate Net-Zero Standard (version 2, from November 2025). To avoid double counting, our analysis includes projected emissions for scope 1 and scope 2 emissions and 50% of scope 3 emissions. For the illustrative 2030 demand estimate, we construct a hypothetical scenario in the absence of explicit SBTi guidance for that year.

This scenario assumes: (1) half of companies with SBTi net-zero commitments elect to participate in an optional 2030 compensation approach; (2) all participating companies select the SBTi's Recognized status "ton-for-ton" approach; (3) participants exclusively purchase CDR credits, despite the optional allowance for avoidance credits, with assumptions implemented for CDR credit preference. This exploratory scenario is designed to illustrate potential demand dynamics rather than represent an official or expected SBTi requirement.

Self-declared net zero: This forecast models demand from companies with public net-zero targets not validated by SBTi. The Medium Scenario assumes existing targets are met, while the Low Scenario assumes some companies retreat.

Carbon claims (carbon neutral): This forecast models demand from companies claiming carbon neutrality, which involves offsetting a specific scope of emissions without the deep decarbonization required by a net-zero target. The Medium Scenario assumes the existing claims continue, while the Low Scenario assumes some companies stop making these claims. Reduction credits dominate this category.

CORSIA: This pillar uses a bottom-up model projecting demand for over 400 individual airlines. It forecasts future emissions by factoring in regional passenger growth rates and the adoption of in-sector decarbonization measures like Sustainable Aviation Fuels, technology, and operational efficiencies. The Low Scenario assumes CORSIA participation by all International Civil Aviation Organization (ICAO) member states, excluding the US, China, and Russia. The Medium Scenario includes all ICAO member states excluding China and Russia. Models assume that the CORSIA scheme will renew after its current end date in 2035.

Carbon Direct adjustments:

Two different possible pathways are assessed to explore buyer preference scenarios that may play out in the future. These are:

1. **Portfolio approach:** This scenario is market-led; it assumes companies will continue to take a balanced portfolio approach partly dictated by costs and supply-side availability.
2. **Like-for-like approach:** This scenario assumes an overall trend toward the like-for-like approach and the Oxford Principles. It indicates a linear ramp-up to only high-durability credits for SBTi and self-declared net-zero demand by mid-century; following the Oxford Principles and an s-curve.

12 Top buyers were defined from internal and CDR.fyi data.

13 The Medium Scenario assumes all currently committed companies with these targets continue to engage, but does not assume any additional companies will join the framework. The Low scenario assumes a portion of these companies will retreat from their commitments, lowering overall demand.

Registry analysis methods

For the registry analysis of the VCM, we employed a methodology that integrates multiple data sources to ensure robust coverage. We built the core of the analysis around data from several established databases and registries that track carbon credit issuances, retirements, and cancellations. Data across different sources covers until December 31, 2025. The Carbon Plan Offsets Database served as one of the foundational sources, offering detailed information on carbon credit issuances, retirements, and cancellations. This was complemented by the Voluntary Registry Offsets Database, developed by the Berkeley Carbon Trading Project, which provided an additional layer of verification. We also incorporated data from the Puro.earth registry, which focuses on high-durability CDR credits. Finally, we used Carbon Direct's proprietary database to track nature-based offtake agreements and the CDR.fyi database to track offtake agreements for high-durability CDR solutions.

Supply forecasting methods

Nature-based CDR

Across nature-based verticals, we conducted a scan of publicly committed capital allocations to nature-based credits, including any information related to the geographic distribution or vertical commitments associated with each source of capital. This pool of committed capital includes nature-based project development funds and developer commitments. It excludes philanthropic capital, government grants, and development finance institution capital unless specifically allocated to a given nature-based project development fund. Where sources of capital did not mandate investment in a specific type of nature-based credit, we assumed a historical distribution of credit generation based on nature-based CDR retirements in major registries.

We then applied vertical-specific adjustments to this pool of identified capital to account for fund-related expenses (e.g., fees, broken deals) and land acquisition costs where applicable. To translate this operational capital into credit generation, we divided each nature-based vertical's capital allocation by a per-credit de-risking cost, based on a proprietary suite of models. The de-risking cost represents the minimum per-credit investment required to activate credits given the nature-based CDR vertical. The total credit generation from this process was then fit to a generalized credit-generation timeline created by averaging a set of real-world ARR and IFM credit generation models.

The result of this model is likely a best case scenario of high-quality natured-based CDR supply based on investible capital. This is due to two key assumptions:

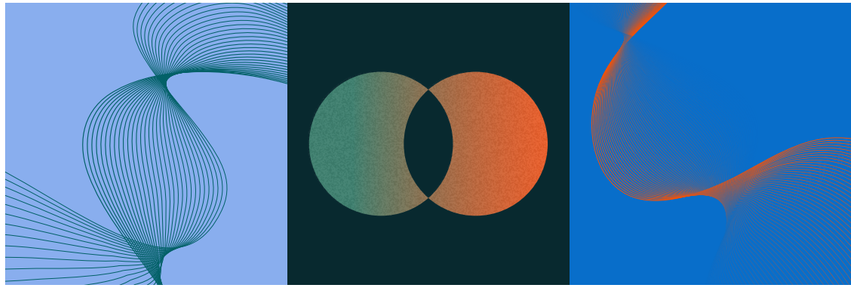
- **High-quality credit generation:** We assume that all funds will be used to generate high-quality nature-based CDR credits. Historically, the majority of invested capital has generated lower-quality credits with cheaper per-credit development costs.
- **Flexible fund deployment:** The majority of funds in the model have an explicit mandate to purchase land for nature-based CDR credit project development. If market conditions change, investment currently marked for nature-based CDR projects could be reallocated to non-carbon end uses.

High-durability CDR

For high-durability CDR, we aggregated and anonymized data on capacity and pricing for carbon capture, utilization, and storage (CCUS) projects to identify the total potential capacity of facilities with explicit plans to sell credits into the VCM. We then leveraged our scientific and commercial understanding of the market to produce two views: (1) technoeconomically feasible capacity and (2) likely and operational capacity:

- **Technoeconomically feasible capacity** represents facilities that could come online assuming business-as-usual technological progression and sufficient forward demand through bankable offtake agreements.
- **Likely and operational capacity** represents facilities with proven technologies sufficient commercial traction to bring the facilities online.

We consider a holistic suite of qualitative and quantitative variables—including front-end engineering design status, final investment decision status, offtake quantity, capital availability and funding, project siting, permitting status, regulatory risk, and business partnerships—to determine project feasibility. The key advantage of this approach is its more selective and realistic aggregation of potential supply. It controls for inflated supply projections often found in supplier announcements (e.g., on websites or in promotional materials), which can overestimate capacity and underestimate development timelines.



Glossary

Advanced market commitment (AMC): A contractual commitment by buyers to purchase a predefined volume of carbon dioxide removal (CDR) credits in the future at agreed terms, intended to catalyze early investment and scale emerging CDR technologies by reducing demand uncertainty.

Afforestation, reforestation, and revegetation (ARR): Nature-based carbon dioxide removal activities that increase carbon storage in vegetation and soils by establishing forests on non-forested land (afforestation), restoring forests on previously forested land (reforestation), or restoring other native vegetation types (revegetation).

Bankability: The degree to which a carbon project or offtake contract can support external financing. Bankable projects typically feature long-term contracts, payment certainty, credible counterparties, and sufficiently low risk to attract debt or project finance.

Bioenergy with carbon capture and storage (BECCS): A carbon dioxide removal pathway in which biomass is used to produce energy, CO_2 emissions from conversion are captured, and the captured CO_2 is permanently stored in geologic formations.

Biomass carbon removal and storage (BiCRS): A class of high-durability CDR pathways that remove atmospheric CO_2 via biomass and store it durably, typically in geologic reservoirs. BiCRS includes approaches such as bio-oil injection, biomass burial, and ethanol with carbon capture and storage.

Carbon dioxide removal (CDR): The process of removing carbon dioxide that has already been emitted into the atmosphere and durably storing it for decades to millennia.

Catalytic offtake: An offtake agreement designed to unlock project financing, accelerate technology learning, and enable early commercial or first-of-a-kind CDR facilities to reach operation.

De-risking: Actions taken to reduce technical, financial, regulatory, or delivery risks associated with a carbon project. De-risking measures include early-stage capital, long-term offtake agreements, project assurance, and policy support.

Direct air capture (DAC): A carbon dioxide removal technology that captures CO_2 directly from ambient air using chemical or physical processes. When paired with permanent geologic storage, DAC is considered a high-durability CDR pathway.

Durability: The length of time removed CO_2 is expected to remain stored and isolated from the atmosphere.

Forward offtake: A purchase agreement in which a buyer commits today to acquire carbon credits that will be delivered in the future. Forward offtake is a critical mechanism for financing and scaling CDR projects.

Geologic CDR: CDR pathways that store CO_2 in geologic formations such as deep saline aquifers or depleted oil and gas reservoirs, offering high durability through long-term storage.

Greenhushing: The practice of deliberately not disclosing carbon credit purchases or climate actions to avoid scrutiny or reputational risk.

High-durability CDR: CDR pathways that store CO_2 for centuries to millennia, including engineered and hybrid approaches such as DAC with geologic storage, BiCRS, and ocean alkalinity enhancement (OAE).

Improved forest management (IFM): A nature-based carbon project category that increases carbon sequestration or reduces emissions through changes in forest management practices relative to a baseline scenario, such as extended harvest rotations or reduced-impact logging.

Integrity Council for the Voluntary Carbon Market (ICVCM): An independent governance body that establishes the Core Carbon Principles (CCPs), which define quality thresholds for carbon credit methodologies in the voluntary carbon market.

Like-for-like approach: A procurement approach aligned with the Oxford Principles in which companies neutralize ongoing emissions using carbon dioxide removal credits rather than avoidance or reduction credits, with an increasing preference for higher-durability removals over time.

Nature-based CDR: Carbon removal approaches that rely on ecosystem processes, including afforestation, reforestation, improved forest management, soil carbon, wetlands, grasslands, and other land-based pathways.

Pathway: A specific technological or nature-based approach used to remove or mitigate greenhouse gas emissions.

Portfolio approach: A market-led procurement strategy in which buyers purchase a mix of carbon credit types across durabilities and pathways based on cost, availability, and risk, rather than prioritizing durability alone.

Project assurance: Independent, third-party technical and commercial oversight conducted during project development and operation to identify risks, verify assumptions, and increase confidence that a project will deliver high-quality credits as contracted.

Spot market: The segment of the voluntary carbon market where already-issued carbon credits are bought and sold for near-term delivery and retirement.

Superpollutants: Non-CO_2 greenhouse gases—such as methane, nitrous oxide, and fluorinated gases—that have high near-term warming potential.

Valley of death: A phase in project development where early-stage capital is exhausted but projects cannot yet access large-scale commercial financing due to insufficient offtake or revenue certainty, risking insolvency or cancellation.

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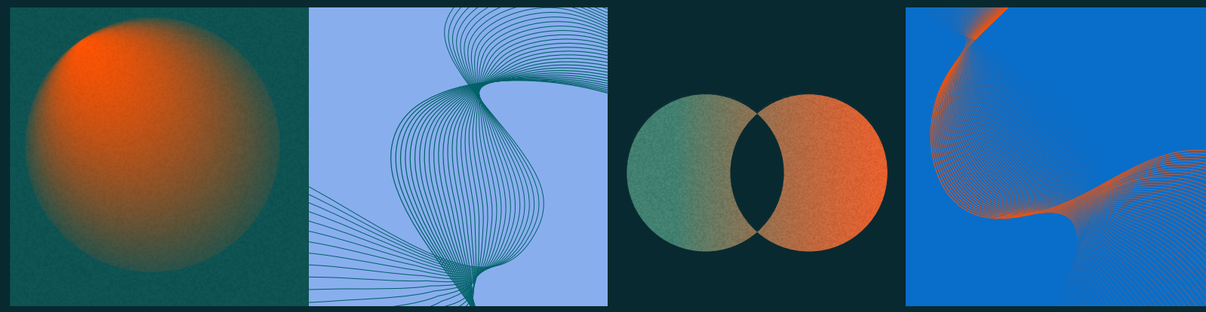

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