Carbon Direct

The Navigator

Distilled insights to navigate rapidly evolving carbon markets | April 2024



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Letter from the Editor

I recently came back from a Tuesday offline to find nearly 100 new bits of climate news. My inbox was full of newsletters and articles. The Carbon Direct Slack was abuzz with debates on science, funding announcements, reports launched, and regulatory proposals. I felt like a baleen whale trying to filter what I needed to know from the sea of what I could know.

It can be overwhelming, but I think the proliferation of news is a good sign that we're finally doubling down on climate action. The amount of first-quarter activity in US carbon policy alone is impressive. This quarter, the Securities and Exchange Commission finally announced rules on corporate climate disclosures. No one was particularly happy with the compromise they struck, but it still marks significant progress (pg. 22). At the state level, we're keeping an eye on over 90 climate-related bills. Multiple landmark California climate bills passed recently, the effects of which will ripple far past state borders (pg. 23). Even the Commodity Futures Trading Commission jumped into the fray proposing fairly stringent (perhaps premature) requirements for carbon credit derivatives.

Earlier, COP28 in Dubai fed widespread consternation over the future of the voluntary carbon market. Article 6 implementation still has a lot of wrinkles to iron out, and we don't expect to see it back on the negotiating table until COP30 at the earliest. At the same time, the market is evolving rapidly through voluntary international frameworks like the VCMI, SBTi, and ICVCM (more on this alphabet soup, pg. 09). Carbon markets don't show any signs of slowing this year—especially the emerging market for CDR credits (pg. 06).

We nearly spent this entire report on the science of carbon management solutions. Instead, we chose to spotlight one in particular—the nascent world of marine CDR (pg. 17). Marine CDR is making waves thanks to its huge potential for scale and the wicked challenge of monitoring impacts in the open ocean.

Thank you for reading this pilot issue of *The Navigator*. We sought to distill key carbon market, science, and policy developments from the quarter, paired with insights from our team of science and policy experts. The goal is to help you better navigate this complex landscape.

We're here to accelerate climate progress—please let us know how we can make this report even more useful to you next quarter.

Bodie Cabiyo, PhD
Editor and Senior Scientist

Market insights

Current market trends

Recap of 2023 and 2024 first quarter

VOLUNTARY CARBON MARKET TRENDS

Despite low expectations, 2023 emerged as a record-breaking year for carbon credit retirements (figure 1). Initially, retirements were expected to remain low in 2023, but December brought an unexpected surge in demand, revitalizing a trend of increasing demand for carbon credits. In 2022, this trend had momentarily slowed, possibly due to concerns over carbon credit quality. Retirements in 2023 were partially driven by large incumbent buyers. For example, according to public disclosures, Shell retired 20 million credits in 2023. Total issuance volumes for 2023 remained comparable to previous years, with renewable energy (RE) and REDD+ credits still the primary credit types meeting buyer demand (figure 2).

So far in 2024, high demand for credits has persisted. Retirements were up by about 20% in the first quarter of 2024 compared to the same time last year. If buyers adhere to past purchasing patterns, total carbon credit demand for 2024 could exceed that of 2023. Unforeseen surges in demand, similar to those witnessed in December 2023, could propel 2024 into another record-breaking year. So far, issuances for 2024 follow the same general patterns seen in recent years. The total volume of issuances is rising despite decreases in the volume of REDD+ and RE issuances. The drop in REDD+ issuances is an expected response as developers prepare for Verra's new consolidated REDD methodology, VM0048.

RETIREMENTS

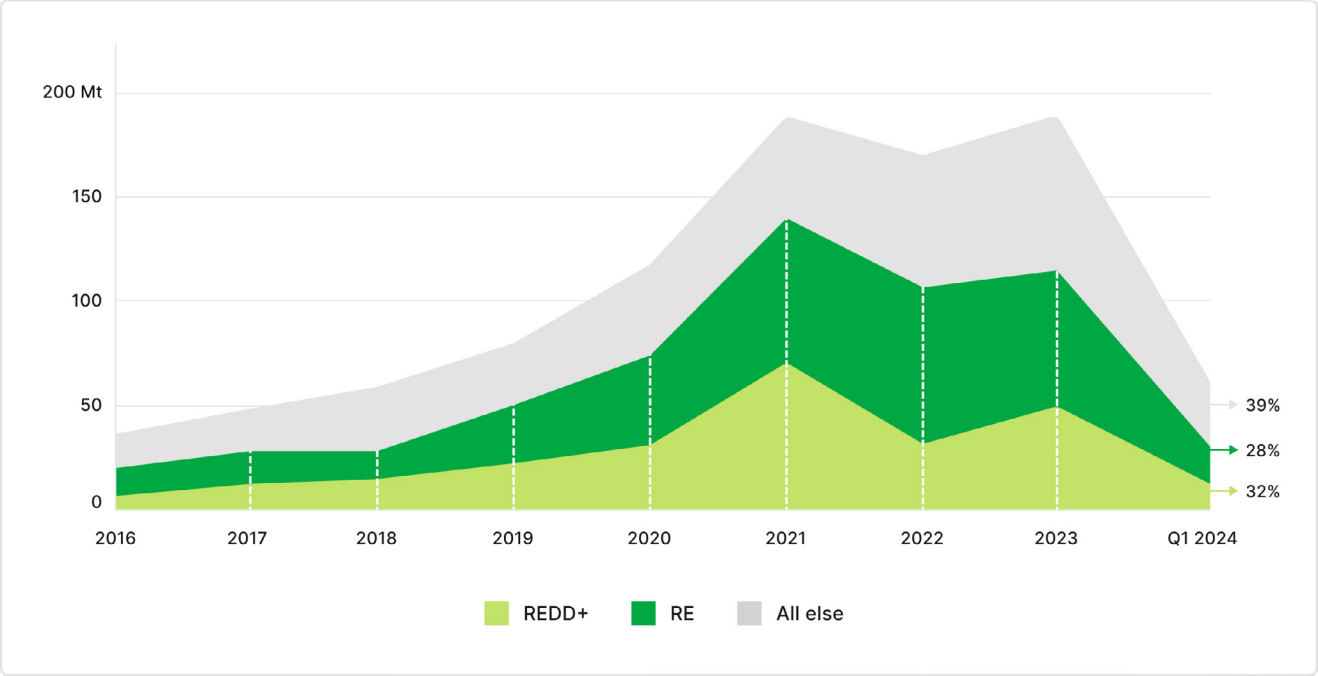


Figure 1: Percentage of retirements by credit category. Note: Numbers as tracked in American Carbon Registry, Climate Action Reserve, Gold Standard, Verra, puro.earth and C-Sink Registry. We include Art Trees Registry's retirements from 2023 onwards. Note: Mt = million tonnes.

ISSUANCES

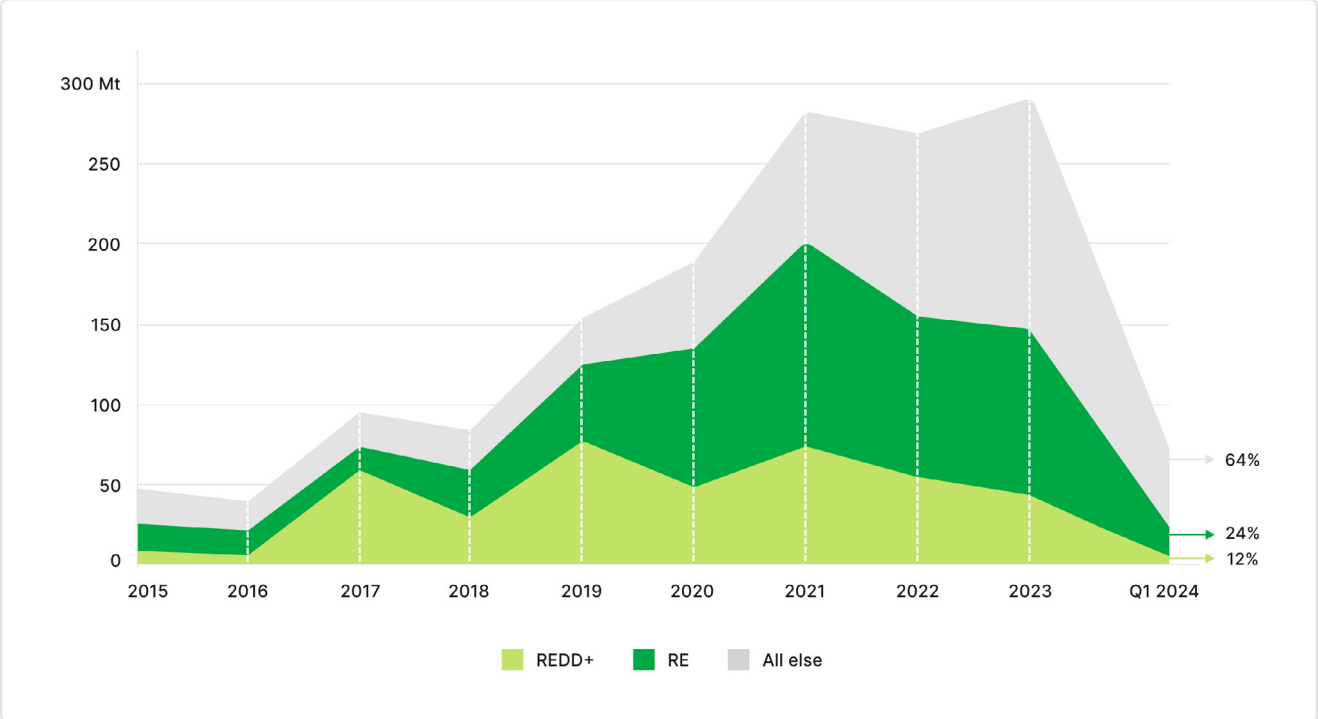


Figure 2: Percentage of issuances by credit category. Note: Numbers as tracked in American Carbon Registry, Climate Action Reserve, Gold Standard, Verra, puro.earth and C-Sink Registry. We include Art Trees Registry's issuances from 2023 onwards. Note: Mt = million tonnes (CO_2e).

CARBON DIOXIDE REMOVALS MARKET TRENDS

Looking specifically at carbon dioxide removal (CDR) credits, we observed slightly higher demand for nature-based CDR in 2023 than in 2022 (see "Issuances" in figure 3), while retirements of biochar CDR credits doubled compared to 2022, mirroring the growth observed in 2022 relative to 2021 (see "Retirements" in figure 3). Overall, issuances of CDR credits in 2023 increased significantly compared to 2022.

Moving into 2024, we witnessed a robust start to the year in terms of retirements. Demand for nature-based removals has already surpassed 4 million tonnes of CO_2e in the first quarter, setting the stage for a potentially record-breaking year in CDR demand for 2024. Demand for higher-durability credits such as biochar has more than tripled in the first quarter of 2024 compared to this time last year.[1] This indicates a growth in quality-oriented removals, as we highlighted in our 2023 State of the Voluntary Carbon Market report.

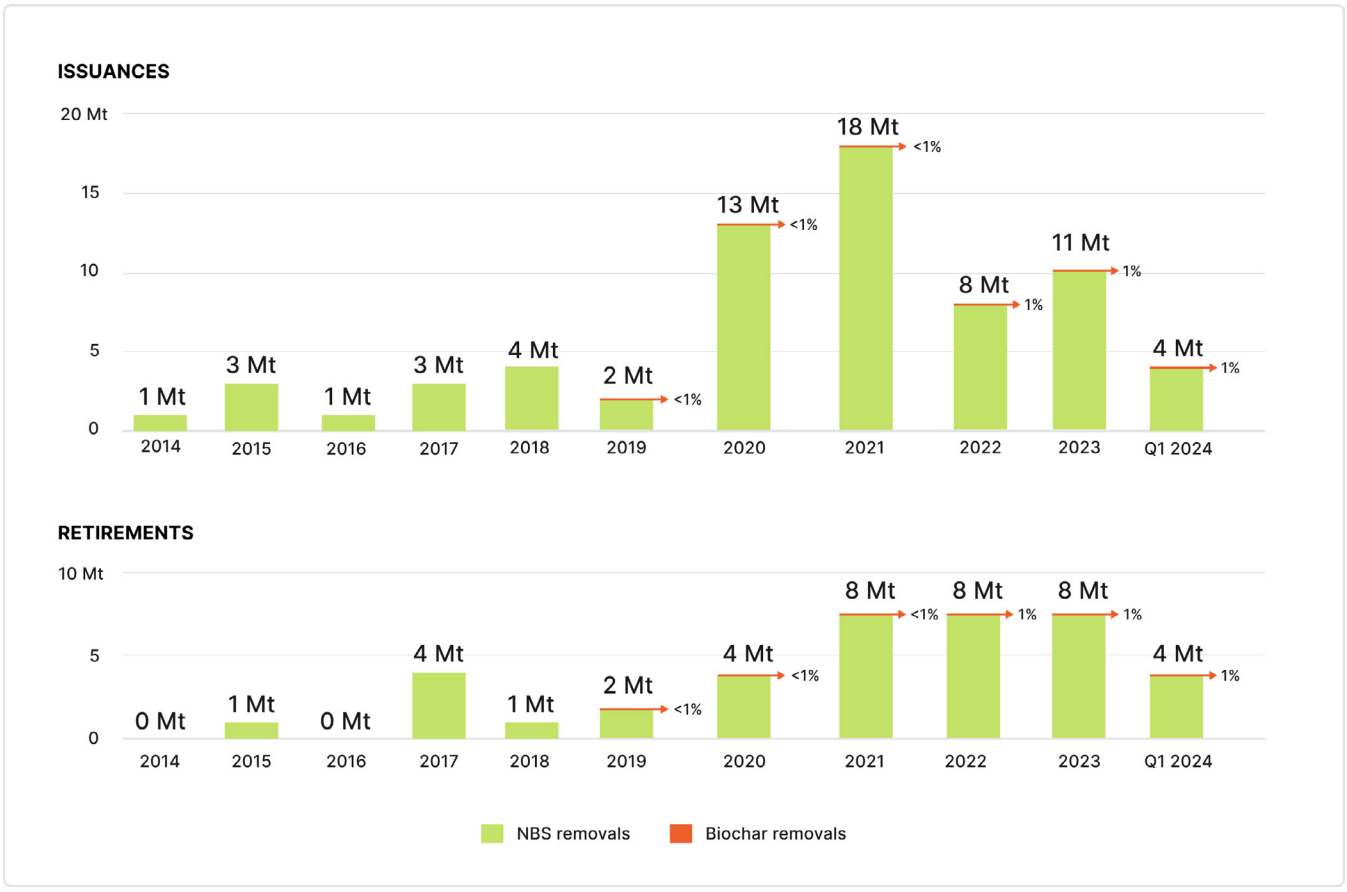


Figure 3: Removal credits issuances and retirements across six registries: American Carbon Registry, Climate Action Reserve, Gold Standard, Verra, puro.earth and C-Sink Registry. Note: Mt = million tonnes (CO_2e).

[1] *According to Carbon Direct analysis, based on biochar retirements as tracked by puro.earth and C-Sink Registry.*

SLOW GROWTH IN PRE-PURCHASE OFFTAKES

Offtake agreements for durable CDR announced in the first quarter of 2024 have not followed the growth seen in CDR credit retirements (figure 4). However, the majority of offtake announcements happened in the latter part of 2023, a year which had significant variability from quarter-to-quarter. Overall, the total pool of offtakes is still relatively small and volatile. Some of the most important offtake agreements that have happened in 2024 so far include Microsoft's purchase agreement of 27,600 tonnes in CDR credits from Neustark over 6 years, Senken's purchase of 81,600 tonnes from Exomad Green to be delivered between 2025 and 2028, and Microsoft's purchase of 95,000 tonnes from The Next 150 over 6 years. To date, Microsoft is a clear leader in durable CDR offtakes, with 3.1 million tonnes registered on the CDR.fyi database.

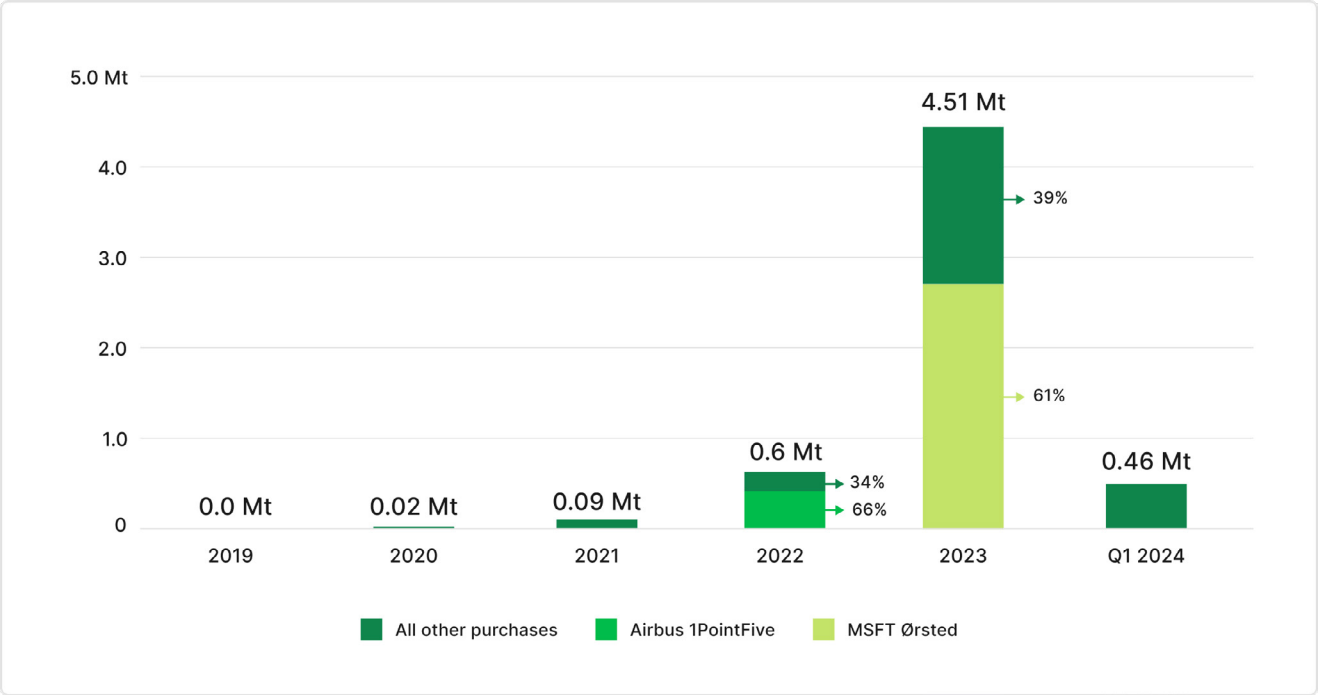


Figure 4: Pre-purchases of durable CDR. Source: Data provided by CDR.fyi under license. Note: Mt = million tonnes (CO_2e).

Recent announcements

Below is a run down of recent announcements in the carbon market including selected funding rounds raised by technology developers, backing of funds investing in the CDR market, and relevant funding opportunities by public or private bodies.

FUNDING ROUNDS RAISED BY TECHNOLOGY DEVELOPERS

In the first quarter of 2024, numerous deals were announced by direct air capture (DAC) technology developers alongside significant raises from startups operating in ocean-based and biochar CDR markets. The proliferation of fundraising activity around DAC solutions in this first quarter of the year—representing over US$180 million—stands out. Carbon Direct monitors the capital raised by CDR suppliers and technology providers and notes the following developments:

Direct air capture

- Mission Zero Technologies (headquartered in the UK) raised its Series A at US$28 million.[2] With an operational DAC plant in the UK (Sheffield), it plans to add two more operational plants in Canada and the UK by the end of 2024.
- Carbon Capture Inc. (headquartered in the US) raised its Series A at US$80 million, to continue deploying its modular, solid sorbent (patented) DAC technology.
- 280 Earth (US headquartered) raised US$15 million. Its DAC technology harnesses waste-heat energy from nearby industrial facilities, lowering its overall energy costs.
- Greenlyte (headquartered in Germany) raised its pre-Series A at US$11 million, to scale its DAC technology with a process that captures CO_2 and produces hydrogen.
- Clarity Tech (headquartered in the US) raised its Seed at US$7 million to build its first pilot plant, with the aim of extracting dilute streams of CO_2.
- Avnos (headquartered in the US) raised its Series A at US$36 million to scale the company's moisture swing adsorption process in Europe and America.
- AirMyne (headquartered in the US) raised its Seed at US$6.9 million to continue developing its liquid sorbent DAC technology.

Ocean-based carbon dioxide removal

- Banyu Carbon (headquartered in the US) raised its Seed at US$6.5 million, to develop carbon capture technology that harnesses sunlight to remove CO2 from the ocean.
- Captura (headquartered in the US) raised its Series A at US$21.5 million.

Biochar

- NovoCarbo (headquartered in Germany) raised US$27 million to scale the company's "Carbon Removal Parks" that they build and operate.
- NetZero (headquartered in France) raised US$19 million to accelerate the industrialization of its biochar production model.

[2] *Some funding rounds are in a different currency, and have been converted for this market research.*

CAPITAL RAISED BY FUNDS

Apple's Restore Fund welcomed Taiwan Semiconductor Manufacturing Company and Murata Manufacturing as new investors, adding US$50 million and US$30 million respectively, making the total committed capital to the fund US$280 million.

FUNDING OPPORTUNITIES

The US Department of Energy (DOE) has opened a funding opportunity of up to US$100 million to support CDR pilot projects and testing facilities, with a particular focus on Small Biomass Carbon Removal and Storage Pilots, Small Mineralization Pilots, and Multi-Pathways Carbon Dioxide Removal Testbed Facilities. Google announced the company would match the DOE's US$35 million initiative to support carbon removal solutions, designed to grow purchases of high-quality CDR credits.

Developments in international voluntary carbon market standards

In 2023, the voluntary carbon market (VCM) faced continued challenges surrounding carbon credit quality, leading to uncertainty around demand for carbon credits going into 2024. On both the supply and demand-side, market initiatives continue working to address challenges related to carbon credit quality and the use of carbon credits in climate claims, with the aim of enabling greater uptake. The first quarter of 2024 saw important developments on this front, as well as important updates on milestones expected later this year. These developments also provide important insight into the "End-to-End Integrity Framework" announced at COP28 last November by the Science Based Targets initiative (SBTi), the Voluntary Carbon Market Integrity Initiative (VCMI), the Integrity Council for Voluntary Carbon Markets (ICVCM), the CDP (formerly Carbon Disclosure Project), the Greenhouse Gas Protocol, and the We Mean Business Coalition, and into particular areas that may need to be reconciled across organizations (figure 5).

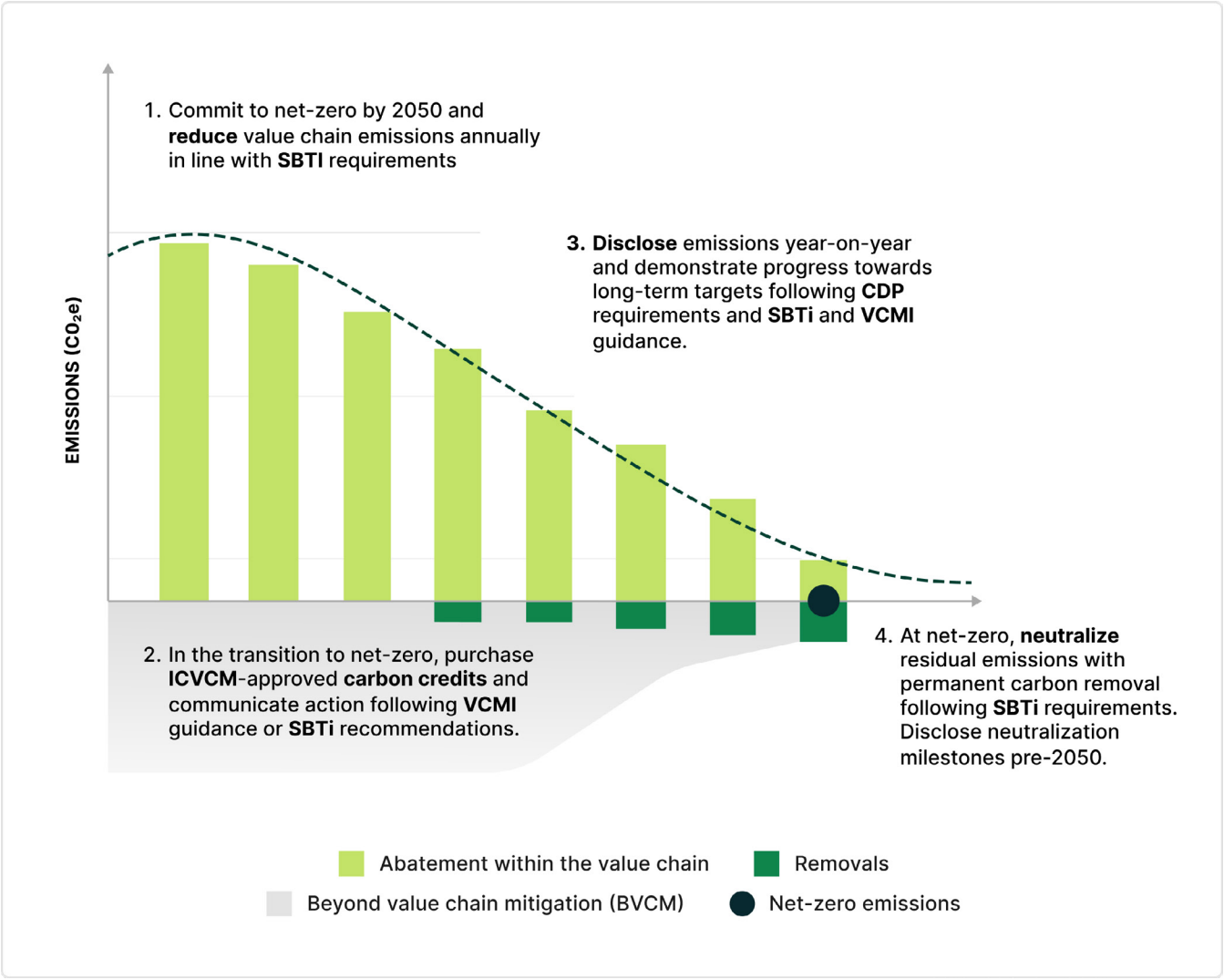


Figure 5. Potential components of the forthcoming End-to-End Integrity Framework based on existing guidance and recommendations (source: Carbon Direct; chart adapted from the SBTi).

First platinum claim under the Voluntary Carbon Market Integrity Initiative

In February 2024, the VCMI announced that Bain & Company (Bain) made the inaugural Carbon Integrity Platinum Claim. This represents the highest level of ambition across the three VCMI claim tiers—Silver, Gold and Platinum—and was achieved through demonstrating compliance with VCMI foundational criteria and purchasing and retiring carbon credits equivalent to 100% or

more of residual emissions.[3] In addition, to comply with the VCMI's carbon credit use and quality thresholds, Bain disclosed information on its carbon credit purchases, including project name, identification number, broker, vintage, and number of purchased credits per project, as well as describing how its due diligence process aligns with the ICVCM's Core Carbon Principles (CCPs).

While the VCMI likely hopes that this announcement will accelerate uptake of the Carbon Integrity Claims, the announcement highlights two considerations:

- **Scale of credit purchases:** Professional services companies have smaller emissions inventories across scope 1, scope 2, and scope 3 emissions compared to other sectors. While the VCMI Silver tier allows for companies to start by retiring 10% of residual emissions in a given year, gradually increasing the number of credits it retires over time, it remains to be seen how many companies in high-emitting sectors will be able or seek to make these claims. Similarly, for companies looking to invest in carbon removal solutions that are currently higher-cost than avoidance or reduction credits, this may impact the feasibility and cost of achieving a given claims tier.
- **Carbon credit quality:** The VCMI provides demand-side VCM guidance. As a result, for determining credit quality thresholds, the VCMI defers to the ICVCM's CCPs and other initiatives, such as the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). Until CCP-eligible credits become available, companies also have the option to publicly disclose how their due diligence process aligns with the CCPs. Given the quality issues on the market, simply attesting to carbon credit quality could present risks—in the case of Bain's disclosures, there is at least one project, the Northern Kenya Grasslands project, that has come under scrutiny in the last year and was subsequently suspended by Verra due to concerns raised by Survival International regarding additionality, leakage, and project benefits. Ultimately, while the VCMI provides needed structure on claims and disclosures associated with credit use, it may not fully insulate buyers from reputational risk.

[3] *The four steps to making a VCMI claim include: (1) demonstrating compliance with the Claims Code of Practice foundational criteria; (2) meeting the requirements of the claim tier, namely purchasing and retiring carbon credits equivalent to a certain percentage of residual emissions; (3) demonstrating compliance with the VCMI carbon credit use and quality thresholds, including detailed credit disclosure; and (4) obtaining third-party assurance following the VCMI Monitoring, Reporting and Assurance (MRA) Framework. For the Carbon Integrity Silver Claim, companies must purchase and retire carbon credits equal to ≥10%–<50% of remaining emissions. For the Carbon Integrity Gold Claim, companies must purchase and retire carbon credits equal to ≥50%–<100% of remaining emissions. Foundational Criteria for all claim tiers include setting and publicly disclosing science-aligned, near-term, emissions reduction targets and publicly committing to reaching net-zero emissions no later than 2050.*

BOTTOM LINE

Bain's inaugural claim provides a useful case study on the current best practice implementation of the VCMI's requirements. It also highlights some early challenges that companies may face as they pursue early VCMI claims. Although VCMI offers a framework for defensible claims, it does not necessarily insulate against credit quality risks.

Beyond value chain mitigation guidance from the Science Based Targets initiative

In February 2024, the SBTi launched its long-awaited guidance on beyond value chain mitigation (BVCM), after more than six months of public consultation. BVCM is one of four key elements of the Corporate Net-Zero Standard and is defined as "mitigation action or investments outside a company's value chain, including activities that avoid or reduce GHG emissions, or remove and store GHGs from the atmosphere."

Beyond value chain mitigation (BVCM)

BVCM is distinct from the concept of neutralization. Neutralization refers to measures that SBTi-aligned companies take to eliminate the climate impact of residual GHG emissions at and after their net-zero target date through the permanent removal and storage of atmospheric carbon. Notably, while neutralization is restricted to permanent carbon removal and is required to meet a net-zero target, BVCM actions are considered above and beyond near-term reduction targets and can include investments in emissions reductions or solutions with shorter-lived carbon storage such as forestation.

The 2023 public consultation on BVCM sought feedback on two key areas: how BVCM should be defined and how to determine the nature and scale of a company's BVCM commitment. Specifically, the consultation proposed three methods for determining the amount of BVCM a company should undertake. These include:

- **Tonne-for-tonne:** an organization delivers BVCM equivalent to some percentage of residual GHGs emissions (in tCO_2e).
- **Money-for-tonne:** an organization applies a carbon price to unabated GHG emissions (e.g., the social cost of carbon) to determine a financial budget for BVCM.
- **Money-for-money:** an organization allocates a share of revenue or profit to determine a financial budget for BVCM.

Given split feedback from the public consultation, the report launched in February does not provide any definitive or specific requirements. Instead, it outlines the best-practice application of each approach. As a result, the BVCM guidance can be thought of as a repository of the various approaches organizations can use to invest in climate projects, as well as providing high-level principles for portfolio design and climate claims.

Nevertheless, the SBTi does outline a recommended best-practice application of BVCM that follows a money-for-tonne approach. Under this approach, organizations would apply a carbon price to residual scope 1, scope 2, and scope 3 emissions to determine a financial budget for BVCM. Of this, the SBTi recommends allocating 50% toward "quantified mitigation outcomes," measured in tCO_2e and generated from 2021 onward, which we interpret to effectively mean ex post carbon credits (both avoidance, reduction, and removal credits). The remaining budget can then be allocated to additional quantified mitigation or toward "unquantified mitigation outcomes," which we interpret to include ex ante carbon removal credits, direct investment in early-stage projects or technologies (e.g., a novel CDR solution), Paris-aligned policy advocacy, and other activities. While the guidance is not prescriptive or binding, we see two important implications for carbon credit buyers:

Carbon removal investment

Under the tonne-for-tonne approach, companies may be incentivized to invest in lower-cost, lower-quality carbon credits in order to match residual emissions with an equal number of carbon credits in a given year. By contrast, under the money-for-tonne approach, companies make investments from a fixed budget. As a result, companies may be incentivized to invest in higher-cost, high-durability carbon removal credits that are currently more expensive than avoidance, reduction, or nature-based carbon removal credits but have more sustained climate impact.

Credible climate claims

- The guidance defines alternative approaches to climate claims. Specifically, the guidance discusses contribution claims as an alternative to compensation claims (e.g., claiming carbon neutrality), in which companies would refer to their contribution to global climate mitigation efforts within a broader decarbonization strategy. In the context of increased regulatory and public scrutiny (such as the EU's Green Claims Directive and California's AB 1305), this type of narrative may help mitigate reputational and legal risk associated with claims.
- While the SBTi has stated that companies can make Carbon Integrity claims to describe BVCM investments, the money-for-tonne approach ultimately sits at odds with the VCMI guidance, which encourages carbon credit investments on a tonne-for-tonne basis and creates a clear incentive structure to drive for higher absolute carbon credit volumes. This is another area that will need to be reconciled in the forthcoming "end-to-end integrity framework."

BOTTOM LINE

Going forward, companies should carefully consider which BVCM approach is most aligned with their near and long-term objectives. If using a money-for-tonne approach, important considerations will be: what carbon price to use; what types of activities to invest in (e.g., quantified or unquantified); and what types of claims to make based on investments (e.g., compensation versus contribution).

Methodology assessment from the Integrity Council for Voluntary Carbon Markets

In January 2024, the ICVCM announced that it has begun assessments of over 100 carbon credit methodologies for adherence to their CCPs. The first approved categories are expected by the end of March 2024 and all assessments are expected to be completed by September 2024.

It remains to be seen what share of carbon credits will be excluded from CCP eligibility. While Verra's submission to the ICVCM excluded previous REDD+ methodologies, which currently make up 27% of credits in the market, these projects will have a pathway to transition to updated versions of methodologies.

In either case, buyers should begin assessing the implications of approved or non-approved categories on their current carbon portfolio, to understand whether their makeup of credits will need to shift to align with ICVCM decisions. In the case of VCMI Claims, companies will be required to purchase CCP-approved credits from 2026 onward.[4]

BOTTOM LINE

Carbon Direct will continue to monitor the ICVCM's category-level assessment to understand the impact on market coverage and specific project types. More generally, given the methodology-level focus of the ICVCM's assessment and continued challenges around credit quality, Carbon Direct believes that CCP-eligible categories will serve as an important quality floor. While this will be essential for understanding credit eligibility under frameworks like the VCMI, and the ICVCM intends to raise this quality floor over time, quality-focused and risk-averse buyers will likely want to continue project-level vetting, both for reputational and carbon integrity reasons.

[4] *The full list of methodologies that have been excluded by carbon programs for category-level assessment, either because they are inactive or have been replaced by a more recent methodology, can be found here.*

What we're watching in markets

Scope 3 Flexibility Claim from the Voluntary Carbon Markets Integrity Initiative

In January 2024, the VCMI announced a Request for Proposals on its Scope 3 Flexibility Claim, with the aim of providing detailed analysis on requirements and guardrails for the claim. This work will take place through the first half of 2024, with the final guidance expected in September 2024.

WHY IT MATTERS

It remains to be seen whether the Scope 3 Flexibility Claim will increase VCMI uptake. In addition, it is unclear what the market acceptance of this claim will be, due to its divergence from previous voluntary guidance restricting the use of carbon credits for meeting emissions reduction targets. In April 2024, the SBTi announced that it intends to allow for the use of environmental attribute certificates, including carbon credits, for scope 3 reduction targets, which would align its requirements with the Scope 3 Flexibility Claim. Organizations should monitor developments on this front, including the publication of a discussion paper in July 2024 with a draft proposal from SBTi about potential changes to scope 3 guidance

Debate on direct air capture costs

The publication of a new study on future DAC costs, which claims that future DAC removal costs at gigatonne scale[5] could be about US$360/$tCO_2$ ($226–835/$tCO_2$ at 90% confidence interval), has sparked discussions on social media. This study's projections are at the high end of the ranges suggested in previous academic literature and exceed the claimed future costs by both established and emerging DAC technology developers. While the most established DAC technology providers today are targeting megatonne-scale costs at US$400–700/$tCO_2$ before 2030, some earlier-stage companies are targeting megatonne-scale costs of around US$140/$tCO_2$. This highlights a situation where novel DAC technology providers are targeting near- to mid-term costs that more established providers only see after dozens of their large-scale plants have been built.

[5] *Gigatonne scale for DAC will not be reached until the 2040s at the earliest.*

WHY IT MATTERS

This debate highlights a few key observations about price projections for engineered CDR:

- **Assessing the maturity of technologies is crucial in making comparisons.** While the new study analyzes three of the most mature DAC technologies that have an operating pre-pilot, pilot, or a commercial-scale plant, some costs given by startups rely on pure estimates. Cost estimates provided before the first project has been commissioned and operated have larger uncertainties and should be taken with cautiousness.
- **Energy source and location matters.** DAC is a highly energy-intensive process. Assumptions behind energy costs and gray emissions associated with energy production will have a big impact on the final projected costs.
- **Cost will ultimately decrease based on deployment.** Initial plants may have high maintenance costs and will have early-stage problems that will lead to downtimes and to plants' outputs growing slowly toward their design capacities. This will result in higher removal costs but will allow the DAC industry to enter a learning curve. It is critical to understand the potential to reduce costs based on deployment and learning from operating real facilities.
- **There is a difference between cost and price.** While academic studies often state costs with assumptions on capital returns, final CDR prices in future markets will be determined by quality, supply, and competition.

Only time will tell where DAC costs will land. At Carbon Direct we rely on high technology readiness level technologies to estimate future credit prices and we are cautious when hearing optimistic cost estimates for technologies at a very early stage. Although innovation should be stimulated, costs will ultimately decrease with deployment.

Science insights

Marine-based carbon dioxide removal

Marine-based carbon dioxide removal (mCDR) technologies have the potential to remove carbon at an enormous scale. This group of technologies includes approaches involving macroalgae cultivation, nutrient fertilization, artificial upwelling and downwelling, recovery of relevant ecosystems, and ocean alkalinity enhancement (OAE). Through the addition of alkaline minerals, OAE has the potential for gigatonnes of CDR annually. The last few months have been transformative for mCDR advancement, attracting increased attention from buyers and other stakeholders as a potentially viable large-scale CDR technique.

As with all CDR approaches, mCDR methods face a distinct set of challenges that must be addressed before they can be deployed. The major challenges in mCDR are:

- The need for a degree of control over the carbon cycle and fate of carbon in the open oceans,
- Challenging monitoring, reporting, and verification (MRV), and
- Accessibility and feasibility of experimentation in the ocean.

Because mCDR involves leveraging and shifting the chemistry of the oceans to support the storage of carbon, MRV for mCDR involves tracking carbon in a vast open ocean system with dynamic and complex conditions and interrelated chemistry. This presents challenges across mCDR approaches. Experimenting in the marine environment is critical as oceanic conditions and physical systems cannot be replicated in the laboratory. The scale of mCDR technologies needed to obtain useful data, and the permits required, often present significant roadblocks for mCDR technologies to develop beyond labscale. Effective MRV for mCDR will depend on developing accurate, standardized, and cost-effective methods to assess the efficacy and impacts of these interventions across dynamic ocean systems. A robust MRV framework is essential to ensure that mCDR buyers can have confidence they are purchasing quantifiable tonnes of CDR.

What's happening now?

In 2023, over 400 scientists urged mCDR research and development in an open letter, emphasizing the need to understand the oceans' CO_2-capturing potential and evaluate associated risks. This call aligns with the recent announcement by the Department of Commerce and the National Oceanic and Atmospheric Administration (NOAA) of US$24 million in funding for 17 mCDR projects. This substantial investment includes US$14 million for 10 projects investigating methods such as OAE and seaweed sinking. These initiatives, spanning diverse locations and scales—from wastewater treatment procedures to deep-sea ecosystem modeling—aim to assess the scalability, effectiveness, costs, and impacts of mCDR.

The projects are in line with NOAA's Carbon Dioxide Removal Strategy focusing on observation networks, modeling impacts, and decision support for responsible scaling of these strategies. Philanthropic funding for mCDR research is also growing, including the US$50 million Carbon to Sea Initiative launched in 2023. And a new paper offers a standardized guideline to address common disagreements in methodology and provide recommendations for deploying large-scale mCDR research, particularly OAE. The paper emphasizes the need for transparent MRV processes and a mix of observational methods and numerical simulations for accurate carbon removal quantification. Isometric has been developing an OAE MRV protocol in collaboration with subject matter experts from CDR suppliers, non-profit organizations, academic institutions, and more.

More recently, as OAE methods gain attention, there is an increased focus on electrochemical systems, in addition to traditional methods involving the controlled addition of alkaline materials such as lime or brucite into the ocean. Currently, OAE methods utilizing seawater electrolysis and seawater dissociation via electrodialysis are energy-intensive and require low-carbon electricity to be most effective on a life-cycle basis. Research efforts in this field aim to optimize these systems to reduce the energy demand and lower the cost of mCDR. In certain instances, research and advancements in water electrolysis for green hydrogen production can be applied.

Who pays for monitoring, reporting, and verification?

Developing robust MRV processes for OAE requires significant investment in both direct measurement and modeling. This endeavor relies on sophisticated technologies to accurately monitor for ecosystem changes and assess shifts in key parameters such as the partial pressure of CO_2 (pCO_2) and ocean pH. Crucially, OAE does not immediately remove CO_2 from the atmosphere. Instead, alkalinity-treated seawater gradually draws down atmospheric CO_2 over a timescale that can range from days to years, which poses challenges for establishing the delivery date of realized atmospheric CO_2 removal. Given the dynamic nature of the ocean environment and

the slow equilibration of CO_2, observational methods alone will not suffice for comprehensive MRV. Therefore, the development of fit-for-purpose models, validated against observational data, will be essential. This investment is crucial for ensuring the effectiveness, transparency, and accountability of OAE research, laying the foundation for informed decision-making and the responsible scaling of mCDR technologies.

However, given the early-stage nature of mCDR, the issue of who will pay for developing and maintaining these MRV systems is not yet resolved. One model is for independent carbon registries and MRV companies to provide MRV services, such as the recently announced partnership between Isometric and [C]Worthy. Another model is for providers of mCDR to establish protocols and methodologies themselves, such as those recently released by Planetary and Running Tide. A third model (which has not yet been implemented) could be for governments to establish and oversee an MRV framework, somewhat analogously to the California Low Carbon Fuel Standard verification process.

One key question is on the role that companies should play in developing advanced OAE MRV methods and how they can recoup the costs of doing so. Holding the resulting MRV methods as proprietary intellectual property makes it difficult for the market to transparently assess their validity, but companies are understandably reluctant to invest in MRV development and then fully share the results as an open source. MRV development costs include software development and deployment, as well as physical testing for model calibration. Research institutions and governments may have an important role to play in this, but their efforts to date have lagged behind the market.

When will marine-based carbon dioxide removal be viable for offtake?

Some CDR buyers have already procured small amounts of mCDR but these have been relatively limited to date. Several key uncertainties must be addressed before mCDR can become a viable pathway for larger-scale CDR offtake.

First, the scientific and technical methods for MRV to quantify mCDR outcomes are improving but still need to be further matured and standardized. Some of the at-sea testing supported by the research and development initiatives mentioned earlier will help, providing crucial data and real-world experience with measuring key variables. However, much hinges on how openly data will be shared among various mCDR companies participating in these programs and conducting their own internal research. More transparency on these measurement methods, results, and data analysis methods will help accelerate the maturation and standardization of MRV approaches. The forthcoming Isometric OAE MRV protocol is poised to progress standardization of methodologies.

Second, there are still important scientific questions to resolve about the potential ecological impacts of some mCDR approaches. Large-scale treatment of seawater to modify alkalinity, or the large-scale introduction of macroalgae growth in the open ocean, may have cascading impacts on marine ecosystems that are hard to predict from laboratory or small-scale experiments. What is needed are increasingly large-scale, at-sea tests that use best-available scientific instrumentation to assess impacts on phytoplankton, calcifiers (e.g., corals, molluscs), and other marine organisms. This work will help teach researchers and mCDR companies the best way to implement mCDR approaches (including factors such as location, timing, materials, etc.) that minimize ecological impacts while maximizing net carbon removal.

Third, many communities rely on the ocean for their livelihood, through fishing, shipping, tourism and other activities. A crucial aspect of successful mCDR will be to closely involve these communities in the planning and governance of projects. Developers have made some important steps toward this, but they will need to continue expanding and refining their public outreach and community engagement to understand and address concerns, and ensure benefits are allocated in a just and equitable manner. Because many mCDR companies have focused primarily on technical and scientific issues, they may need support in building capacity for community engagement. Models of best-in-class community engagement efforts by mCDR companies (or other CDR companies) will be helpful.

While the exact timelines for resolving these issues are difficult to predict, there is a good chance that more high-quality mCDR tonnes will be increasingly available on the market at a small-to-medium scale over the next few years. If mCDR companies can successfully address the three key challenges outlined above (MRV maturation, understanding ecological impact, and effective community engagement) the timeline for larger availability could be much closer than was previously expected. Carbon Direct continues to follow the evolution of mCDR technologies, policies, and markets closely and will provide periodic updates to our assessment of the overall state of mCDR.

What we're watching in science

Breakthrough in cellulosic biofuels

A new study highlights the economic potential for the production of next-generation biofuels by addressing the challenge of breaking down plant matter. The study focuses on lignin, a key component of plant cell walls that has been difficult to extract and use in biofuel production. Co-solvent enhanced lignocellulosic fractionation (CELF), a pretreatment technology using a renewable chemical called tetrahydrofuran (THF), has shown promising results in improving the efficiency of extracting and utilizing lignin and sugars found in biomass.

WHY IT MATTERS

CELF has the potential to greatly lower the cost of producing sustainable aviation fuels (SAF) and other biofuels from inedible feedstocks (e.g., woody biomass, agricultural residues) by reducing the effort required to break down plant matter and increasing the amount of biomass that can be used for fuel. The study indicates that, by enabling the production of SAF at a break-even price that is lower than average market prices of petroleum, CELF could significantly reduce the cost barrier, making SAF more competitive with traditional jet fuel. This cost reduction potential is further bolstered by the economic benefits of using denser feedstocks, like hardwood poplar, in a CELF biorefinery—possibly yielding higher fuel and chemical outputs compared to less carbon-dense alternatives like corn stover.

Additionally, the US government's issuance of Renewable Identification Number (RIN) credits, which are typically traded at US$1 per gallon or higher for second-generation biofuels produced using CELF technology, adds to the economic viability of SAF production. Beyond financial advantages, CELF's efficient utilization of lignin and production of renewable chemicals contribute to lowering the carbon footprint of biofuel production, aligning with the aviation industry's sustainability goals. These combined factors suggest a potential market boost for SAF, with CELF technology leading the charge toward a more cost-effective, economically feasible, and environmentally sustainable future for aviation fuel.

Policy insights

United States federal regulations

The long-awaited final Securities and Exchange Commission rule

In April 2022, the US Securities and Exchange Commission (SEC) proposed a rule that would require all publicly traded companies currently reporting to the SEC to disclose their greenhouse gas (GHG) emissions, identify climate-related risks, and share mitigating actions. When the rule was finalized on March 6, 2024, it differed significantly from the original proposal and is less stringent.

The final rule defines looser thresholds for reporting scope 1 and scope 2 emissions. It contains no requirements to report on scope 3 emissions. Under the final rule, companies must only report information about scope 1 and scope 2 emissions when those emissions are "material." In the context of this rule, "materiality," according to SEC Chair Gary Gensler, "refers to the importance of information to investment and voting decisions about a particular company, not to the importance of the information to climate-related issues outside of those decisions." As with the proposed rule, the final rule will still require information about a registrant's climate-related risks that "have had or are reasonably likely to have material impact on its business strategy, results of operation, or financial condition."

The final rule was published in the Federal Register on March 28, 2024 and becomes effective 60 days later on May 28, 2024. Compliance is phased in and deadlines for reporting will depend on the registrant's status as either a Large Accelerated Filer (LAF), an Accelerated Filer (AF), or a Small Reporting Company (SRC). LAFs will need to report certain information starting in their fiscal year filings that begin in 2025.

What's to come?

Even with this diminished standard, the SEC faces legal challenges to the rule. Several Republican Attorneys General have already filed suit. Legal experts anticipate the challengers to invoke the "Major Questions" doctrine, a legal theory championed by conservatives that says Congress

must give explicit authority to an executive branch agency before that agency may promulgate regulations on the subject. The issue of what will be considered "material," and therefore required to be disclosed, is sure to be part of the legal and political wrangling around this rule. The term "material" was first used in the Securities Act of 1933 and was litigated in the 1976 Supreme Court case TSC Industries, Inc. v. Northway, Inc. Based on the outcome of this 1976 case, a fact is generally understood to be "material" if there is "a substantial likelihood that a reasonable shareholder would consider it important in deciding how to vote." Potentially affected companies should closely follow these legal proceedings to see if and how they determine the disclosure timelines or requirements.

What do you need to know?

Even while legal challenges to the SEC rule come from the right, many in the environmental community express frustration over the final rule being less stringent than the initial proposal. Ultimately, the SEC aimed to strike a balance that gave the rule the best chance of standing up to judicial review. Even with legal challenges to the rule and potential Republican-led regulatory rollbacks in a possible second Trump administration, companies should start preparing now; reporting is not a question of if, but of when. The SEC rule is not the only governmental mandate requiring companies to disclose certain climate-related information. The passage of landmark climate disclosure laws in California (discussed below) along with coming regulations in the European Union (EU) and China demonstrate the growing push for these types of disclosures. Savvy companies will begin preparing now to stay ahead of the competition.

New 2023 California climate regulations

During the 2023 session of the California State Legislature, several new bills addressing climate change were passed and signed into law. Some of these laws require companies to issue certain disclosures about their emissions and any efforts to offset them with carbon removal credits. These bills will affect companies "doing business in California," a phrase which many companies will need to become familiar with. Because California is one of the world's largest economies, companies that are unsure if they are "doing business in California" would be wise to assume that they have some form of operations in California or will in the future. All companies should prepare now to be compliant with these rules. A breakdown of new California laws requiring emissions disclosures with details on which companies are covered, what is required of them, and dates the laws take effect is provided in table 1.

Table 1: New 2023 California laws requiring climate-related disclosures

LAW	WHICH COMPANIES?	WHAT IS REQUIRED?	WHEN DOES IT TAKE EFFECT?
SB 253	Companies doing business in California with total annual revenues in excess of US$1 billion	Publicly disclose scope 1, scope 2, and scope 3 greenhouse gas emissions	**Scope 1 and 2:** Starting in 2026 (or by a date to be determined by the California Air Resources Board) and annually thereafter **Scope 3:** Starting in 2027 and annually thereafter
SB 261	Companies doing business in California with total annual revenues in excess of US$500 million	Publicly disclose climate-related financial risks and mitigation measures adopted	Must be posted on company website on or before January 1, 2026 and biennially thereafter
AB 1305	Companies operating within California that make claims of achieving "net-zero emissions," sell a product claiming to be "carbon-neutral," or make other similar claims through the purchase or use of voluntary carbon offsets	Publicly disclose how a claim was determined to be accurate or was actually accomplished; how interim progress toward that goal is being measured; and whether there is independent third-party verification of the company data and claims listed	Law went into effect on January 1, 2024* and companies are required to update disclosures annually

* Assemblyman Jesse Gabriel sent a letter to the Assembly Clerk in December 2023, which was published in the Journal on January 3, 2024. The letter stated that his intent was for the law to not take effect until 2025, though that letter is not binding. Assemblyman Gabriel later introduced a bill, AB 2331, in February 2024 to make a handful of amendments to the AB 1305, most notably codifying an effective date to be January 1, 2025. More on AB 2331 can be found below in the section on legislation we are tracking at the state level.

Other pending California legislation

Other pending California legislation could use similar disclosure regulations to impact how carbon credits are verified and certified. SB 1036, called "Voluntary Carbon Offsets: Business Regulation," would make several amendments to the state's false advertising laws. This legislation would to make it unlawful for a person to market, sell, verify, certify, or maintain on a registry a carbon credit

if the person "knows or should know" that the durability of the credit's GHG reduction or removal is less than the atmospheric lifetime of carbon dioxide emissions, or is unlikely to be quantifiable, real, and additional. Ultimately, this bill would protect purchasers of offsets from legal action if their credits turn out to be faulty while putting more of an onus on sellers and marketers to ensure the credits are valid.

In 2023, SB 390, an identical bill, passed both the Assembly and Senate before being vetoed by Governor Newsom. While the governor did not elaborate on specifics about his concerns with the bill, phrases like a seller or broker of offsets "knows or should know" that an offset is "unlikely to be quantifiable, real, and additional" might have seemed unclear, potentially inviting litigation.

On March 21, 2024, SB 1036 passed out of the Senate Environmental Quality Committee on a 5-0 vote. It is next scheduled for a hearing in the Senate Judiciary Committee on April 9th. While it is on the same track as last year, it still has many hurdles to overcome, including passage before the entire Senate, and then consideration in committee and on the floor of the State Assembly. While it is difficult to predict what might happen if SB 1036 reaches the governor's desk, the governor has not made any public statements indicating he has changed his position on the legislation. It is possible that SB 1036 will meet the same fate as SB 390 and be vetoed. Carbon Direct is tracking this bill closely.

International policy developments

United Nations Article 6 still pending

Last December, the United Nations Framework Convention on Climate Change (UNFCCC) hosted its annual Conference of the Parties (COP) in Dubai. During this conference, referred to as COP28, the Parties to the Paris Agreement, referred to as the CMA, met to discuss the implementation of Article 6 of the Paris Climate Agreement.

Article 6 of the Paris Climate Agreement aims to establish a UNFCCC-regulated international carbon market in which countries can voluntarily trade emissions reductions and removals to meet targets set in their nationally determined contributions (NDCs). There are two sections of Article 6 that prompted multiple days of discussion during COP28:

- Article 6.2 outlines the approach for countries to trade emissions mitigation outcomes with one another through bilateral or multilateral agreements. Tradable units are called Internationally Transferred Mitigation Outcomes (ITMOs).

- Article 6.4 establishes a UNFCCC-regulated carbon market as the trading platform for ITMOs through the establishment of a registry, UN emissions reductions credits (A6.4ERs), as well as a mitigation baseline and credit mechanism for participation by public and private entities.

Dual accounting versus double counting

A key point of discussion during the CMA meetings was the accounting of carbon credits on national and private entity ledgers. As it is currently written, Article 6 allows dual accounting but leaves open a risk of double counting. It is not yet clear how the risk of double counting will be prevented when Article 6 is implemented.

- **Dual accounting** occurs when a government claims an emissions reduction or removal credit in its NDC that is also accounted for or reflected in a non-governmental entity's emissions ledger. This is analogous to when profits are counted in a company's ledger and also contribute to a country's gross domestic product (GDP).
- **Double counting** occurs when more than one public entity (e.g., national government) or more than one private entity (e.g., corporation) claims the same reduction or removal credit(s) toward its emissions ledgers. This would be similar to if two people bought the same movie ticket or theater seat.

At COP28, the CMA determined that Article 6.2 and Article 6.4 needed further development before they could be operational. In response to the concerns raised at COP28, the CMA requested that the Subsidiary Body for Scientific and Technological Advice (SBSTA) develop recommendations for consideration and adoption of Article 6.2 and Article 6.4 by the next CMA meeting in November 2024. Carbon Direct believes it is unlikely that Article 6 will be fully implemented before 2025 (the year of COP30 in Brazil).

The establishment of a UNFCCC-regulated carbon market has the potential to raise the bar for the quality of carbon credits and to standardize the accreditation of carbon credits that are traded around the world. The delay of the implementation of Article 6 and this market mechanism leaves stakeholders on the VCM with uncertainty regarding the future of carbon accounting. On the other hand, the delay opens up an opportunity to address the concerns raised at COP28 and potentially develop a stronger UNFCCC-regulated carbon market.

BOTTOM LINE

While the Paris Agreement does not regulate the VCM, it will change the context of voluntary carbon trading. Carbon Direct believes that, when implemented, Article 6 could require companies purchasing carbon removals against their emissions to either:

- **procure removals in the same geography** (i.e., country or region) as their emissions sources,
- **or receive a corresponding adjustment** from the territory where the removal was procured to be applied toward the territory in which they have an emissions profile.

While the implementation of Article 6 is not imminent, it is important for those in the carbon management space to be aware of potential outcomes, particularly when making decisions on the purchase or development of carbon credits.

European Commission keystone policies

The European Commission published two keystone communications on February 6th, 2024: the EU 2040 Climate Target Communication and the industrial carbon management (ICM) strategy. Combined, these documents bring deep decarbonization into sight for 2030. They confirm the critical role of CDR in decarbonizing hard-to-abate sectors along with technologies such as clean fuels and carbon capture, utilization, and storage (CCUS).

The European Climate Law

These communications complement the European Climate Law, which went into effect in July 2021. The European Climate Law defines the EU's legally binding commitment to reach net zero by 2050. It contains an interim 2030 target, which prescribes a 55% net reduction in GHG emissions. This target is supported by a package of EU policies collectively known as "Fit for 55." The law also includes a requirement for the European Commission to propose a 2040 climate target following the first Global Stocktake of the Paris Agreement, which concluded in December 2023.

The EU 2040 Climate Target Communication recommends an economy-wide, net GHG emissions reduction for Europe of 90% by 2040. This target was determined based on the results of a comprehensive impact assessment of three target options. The 2040 target is aligned with an already-announced EU Green Deal Industrial Plan and the associated Net-Zero Industry Act which seek to enhance the EU's manufacturing capability and competitiveness for net-zero technologies and infrastructure.

For deeper support of the 2040 target, the Commission's ICM strategy sets out nomenclature, definitions, and roles for industrial carbon management. However, the ICM strategy does not set specific standards for qualification nor does it identify which authorities within the Commission will be responsible for implementing key aspects of ICM. To partially address these gaps, the Commission is expected to develop a policy framework that would deploy aspects of ICM, including single-market transport infrastructure, capture and storage of CO_2, removal of CO_2 from the atmosphere, and the use of captured CO_2 as a non-fossil feedstock.

Following the upcoming European elections, the next Commission will be responsible for producing a legislative proposal based on the results of the comprehensive impact assessment, whichww will then be voted on by the European Parliament and Member States. If the 2040 target is adopted, it will require a wave of accompanying "Fit for 90" policies and frameworks to ensure this new climate ambition is achieved (figure 6).

BOTTOM LINE

Even if the 2040 target is met, anticipated residual emissions would be ~850 million tonnes of carbon dioxide equivalent ($MtCO_2e$). For this reason, the Commission's 2040 Climate Target Communication and ICM strategy clearly indicate that nature-based and industrial CDR including carbon capture and storage, carbon capture and utilization, carbon capture utilization and storage, and clean fuels are all indispensable solutions required to achieve the EU's goal of 90% net GHG emissions reductions by 2040. These solutions will be integral to the removal and storage of up to 400 $MtCO_2e$. If the 2040 target is adopted into legislation by the next Commission, it will lock in demand for these climate solutions.

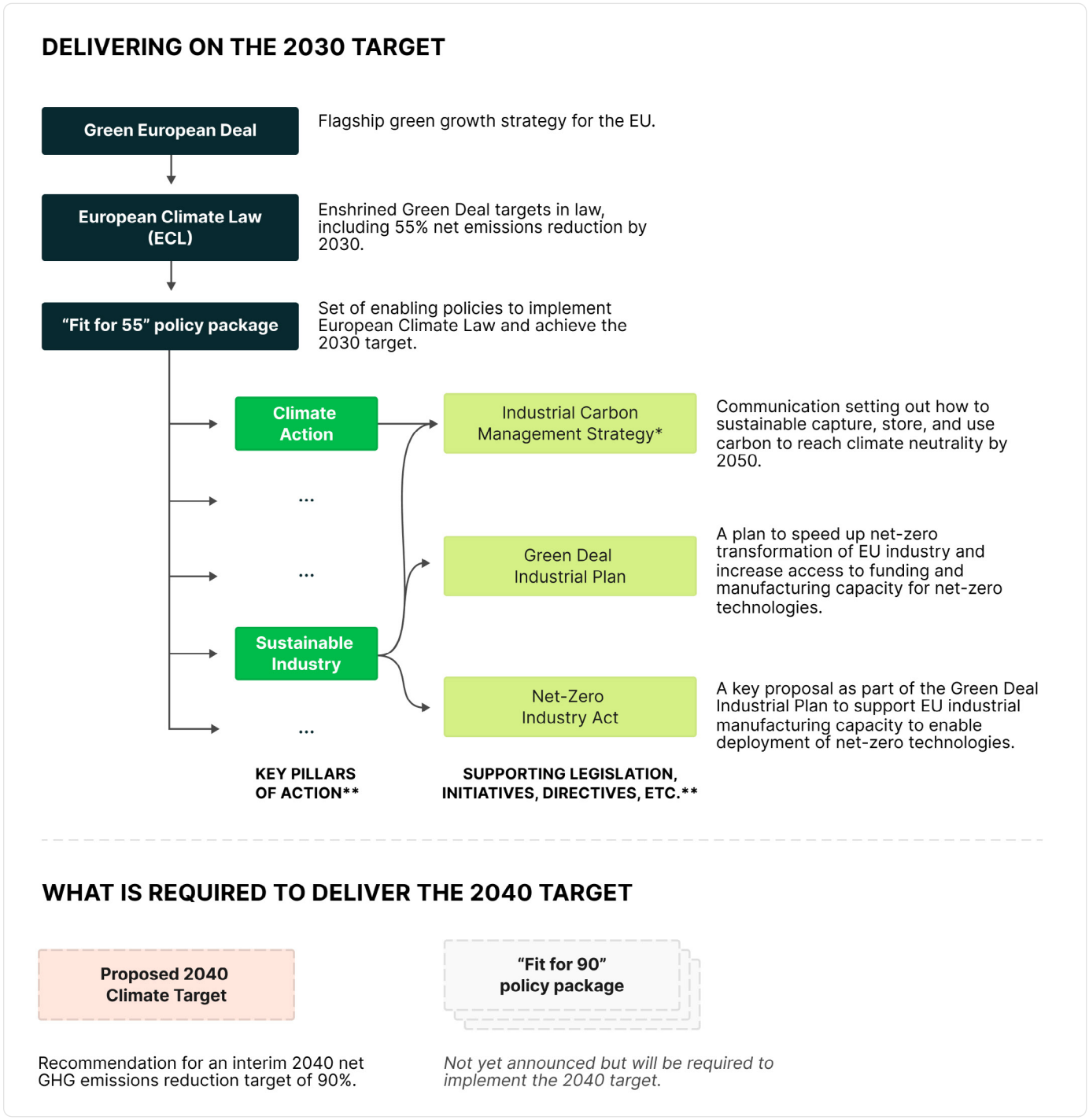


Figure 6: Illustrative representation of where announced policies will fit in the wider array of climate and environmental policies as part of the European Green Deal. Note: *Announced 6th Feb 2024. **Not all shown. Source: Carbon Direct.

What we're watching in policy

United States Commodity Futures Trading Commission guidelines

In December, the US Commodity Futures Trading Commission (CFTC) proposed guidance and sought comment for the trading of Voluntary Carbon Credits (VCCs). The guidance outlines compliance considerations that Designated Contract Markets (DCMs) should weigh when listing VCC derivative contracts for trading. Among other factors, the CFTC's proposed guidance states that DCMs must consider the additionality of the underlying VCC project and the permanence of the underlying GHG removal activities, including any risk of reversal due to the failure of such activities. DCMs must also consider the methodology or protocol used by a crediting program to calculate the level of GHG emission reductions or removals associated with credited projects or activities. Comments on the proposal were due in mid-February, and final guidance is expected to be published by the CFTC in the coming months.

WHY IT MATTERS

Currently, the US carbon derivatives market is small, especially compared to the EU's Emissions Trading System (EU ETS). These regulations will not have a large impact in the near term on the US market, but they will likely become more important over time if the US carbon derivatives market grows. These guidelines also add to a growing effort to push for stronger carbon credit quality standards. The ICVCM developed a list of ten Core Carbon Principles, which the CFTC's guidance largely follows.

The Congressional Review Act

The fate of many climate regulations in the US, such as power plant emissions rules and vehicle emissions rules, may partially depend on the outcome of the 2024 congressional and presidential elections. The Congressional Review Act (CRA) is a tool Congress can use to overturn certain federal executive agency actions. The CRA requires agencies to report the issuance of final (not proposed) rules and regulations to Congress. It also provides Congress with special procedures under which it may consider legislation to overturn rules, namely privileged status for consideration. It can not be filibustered in the Senate, meaning only 51 votes are required for adoption, rather than the 60 votes that are normally needed for cloture. A few key things to know about the CRA are:

- **There is a brief window for action.** If a CRA joint resolution of disapproval is adopted by both chambers of Congress and signed by the President, or if Congress successfully overrides a

presidential veto, the rule at issue cannot go into effect or continue to be in effect. Because a President would likely veto any attempt to block a rule or regulation made by their own administration, the CRA is rarely used. However, the CRA provides the opportunity for a new Congress to consider rules that went into effect within the last 60 session days (Senate) or legislative days (House) after a rule is finalized.

- **Rules that are not finalized soon may be in jeopardy.** Biden administration rules that are finalized this year with less than 60 session or legislative days risk being overturned next year if Republicans control the Presidency, the Senate, and the House. The current calendar for the House and the Senate shows that the 60-day deadline in the Senate is June 11th, 2024 and is even earlier in the House at May 22nd, 2024. Those schedules are subject to change, and the true date will not be known until this Congress adjourns at the end of 2024. However, it appears that the recently finalized SEC climate disclosure regulations would fall outside of the review window for the next Congress.
- **The CRA was used to kill many Obama rules.** The CRA has been used to overturn a total of 20 rules. The vast majority (16) of those rules were overturned in the 115th Congress in 2017, at the start of the Trump administration. Among the Obama-era rules overturned were the Department of the Interior's Stream Protection Rule and an SEC regulation requiring oil, gas, and mining companies to disclose their payments to foreign governments, which was meant to stop corruption.

WHY IT MATTERS

Depending on when various Biden administration rules are finalized, they could see the same fate as many rules from the latter stages of the Obama administration: overturned and prevented from being enforced. We will be watching the Federal Register closely in the coming months to track which regulations may be in jeopardy.

State-level carbon credit bills

We're tracking a number of bills in state legislatures across the country that we think have at least a decent shot of becoming law. Here are a few to keep an eye on that could meaningfully affect carbon markets:

California Assembly Bill 2331 | Voluntary Carbon Market Disclosures

- **Summary:** Makes several amendments to the recently passed AB 1305, most important being a clarification of the date of enforcement to be January 1, 2025. The bill also clarifies that "voluntary carbon offset" does not include a renewable energy certificate (REC) issued through a governmental regulatory body or a low-carbon fuel standard (LCFS) credit.

- **Status:** Referred to the Assembly Committee on Natural Resources where it currently awaits consideration. The California legislature adjourns August 31st.

Washington Senate Bill 6058 | Washington's Carbon Market

- **Summary:** Facilitates linkage of Washington's carbon market with the California-Quebec carbon market.
- **Status:** Approved by both chambers of the legislature. Signed by Governor Inslee on March 28, 2024

Minnesota House Bill 4989 | Agriculture Farming Goals

- **Summary:** Authorizes the Minnisota Commissioner of Agriculture to establish a Minnesota carbon credit market for farmers participating in the clean water, climate-smart, and soil-healthy farming program.
- **Status:** Passed the House Committee on Agriculture Finance and Policy, awaiting action in the Environment and Natural Resources Finance and Policy Committee. The Minnesota legislature adjourns May 20th.

Massachusetts Senate Bill 2096 | Carbon Dioxide Removal Leadership

- **Summary:** Establishes a state-administered procurement program to catalyze carbon dioxide removal. Directs the Massachusetts Clean Energy Center, a state economic development agency dedicated to accelerating the growth of the clean energy sector, to create a pilot program through which the state will make advanced commitments to purchase carbon removal from a wide range of sources.
- **Status:** Reported favorably by the Joint Committee on Telecommunications, Utilities and Energy referred to the Senate Committee on Ways and Means. The Massachusetts legislature adjourns July 31st.

European Union to vote on the Carbon Removal Certification Framework

On February 20, 2024, the European Parliament and the Council announced a provisional agreement on the Carbon Removal Certification Framework (CRCF), the first EU-wide voluntary framework for the certification of high-quality carbon removals. The CRCF must be formally approved by the European Parliament and the Council before it can be implemented. A plenary vote is scheduled during the 2024 April session.

This provisionally-agreed regulation introduces certification rules to "improve the EU's capacity to quantify, monitor and verify the authenticity" of the following carbon removal pathways:

- Nature-based CDR (referred to by the EU as "carbon farming"), which includes restoring forests and soils, emissions avoidance from soils, peatland rehydration, more efficient use of fertilizers, and other innovative farming practices;
- Industrial CDR, such as bioenergy with carbon capture and storage (BECCS), or direct air carbon capture and storage; and
- Carbon utilization in the form of long-lasting products and materials, such as wood-based construction materials or biochar.

The CRCF defines high-quality carbon removals as those in which the carbon removed can be accurately quantified and stored for a defined period of time (e.g., the CRCF specifies a minimum of 35 years of carbon storage in products). The carbon removal pathways must also "go beyond existing practices and don't just reward the status quo." Lastly, the carbon removal pathway must demonstrate that it contributes to broader sustainability goals (e.g., provides positive impacts on biodiversity). The Commission utilized the support of a Carbon Removal Expert Group to develop certification methodologies, the prioritization of which is outlined in this regulation. These methodologies will continue to be developed for each of the carbon removal pathways.

In an effort to establish transparency of certified carbon removals, an EU registry would be established within four years of the formal approval of this regulation. In the meantime, the Commission will recognize the use of existing certification schemes.

WHY IT MATTERS

The CRCF would establish CDR standards, a qualification methodology, and registry for high-quality carbon removals, which could have a harmonizing impact on the integrity of the CDR market as a whole. This elevated integrity will be especially valuable for project developers and credit buyers in EU member states.

Credits and Disclaimer

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