Patch

Rebalance the planet

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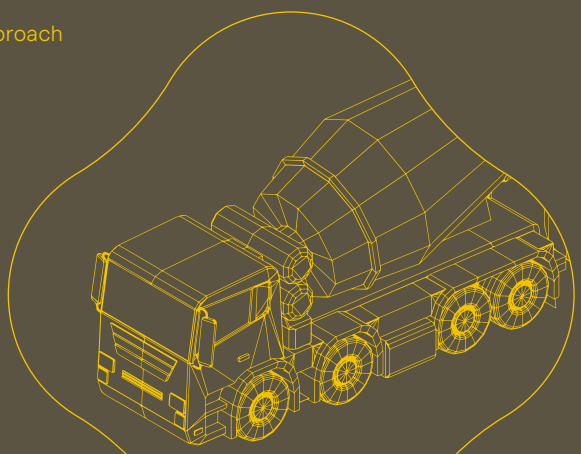
A buyer's guide to carbon credits

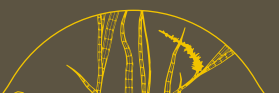
How to engage the voluntary carbon market, explained in three stages

03 A long-term outlook on pricing and supply

02 A portfolio approach



01 An introduction to carbon credits



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Using this guide
Why carbon credits matter

The voluntary carbon market (VCM) is one of the few market-based mechanisms that has been able to funnel real dollars into real climate projects. It provides a pathway for decentralized, private actors to infuse large amounts of capital into a wide range of solutions — fast.

The VCM isn't entirely like any other market in existence. It shares traits with commodities, futures, and many other markets. But unlike those systems, the VCM exists to fund climate solutions that ensure the continued livability of our planet.

Many of those technologies and methods have no other revenue sources. And other means of finance — philanthropy, grants, and private capital — are unlikely to scale to the $4.3 trillion worth of climate finance needed by 2030.[1]

The IPCC's pathways to 1.5°C rely on carbon emissions peaking no later than 2025 and being cut in half by 2030. And even in the most optimistic scenarios, we'll also need about 10 gigatonnes of permanent carbon removal each year by 2050.

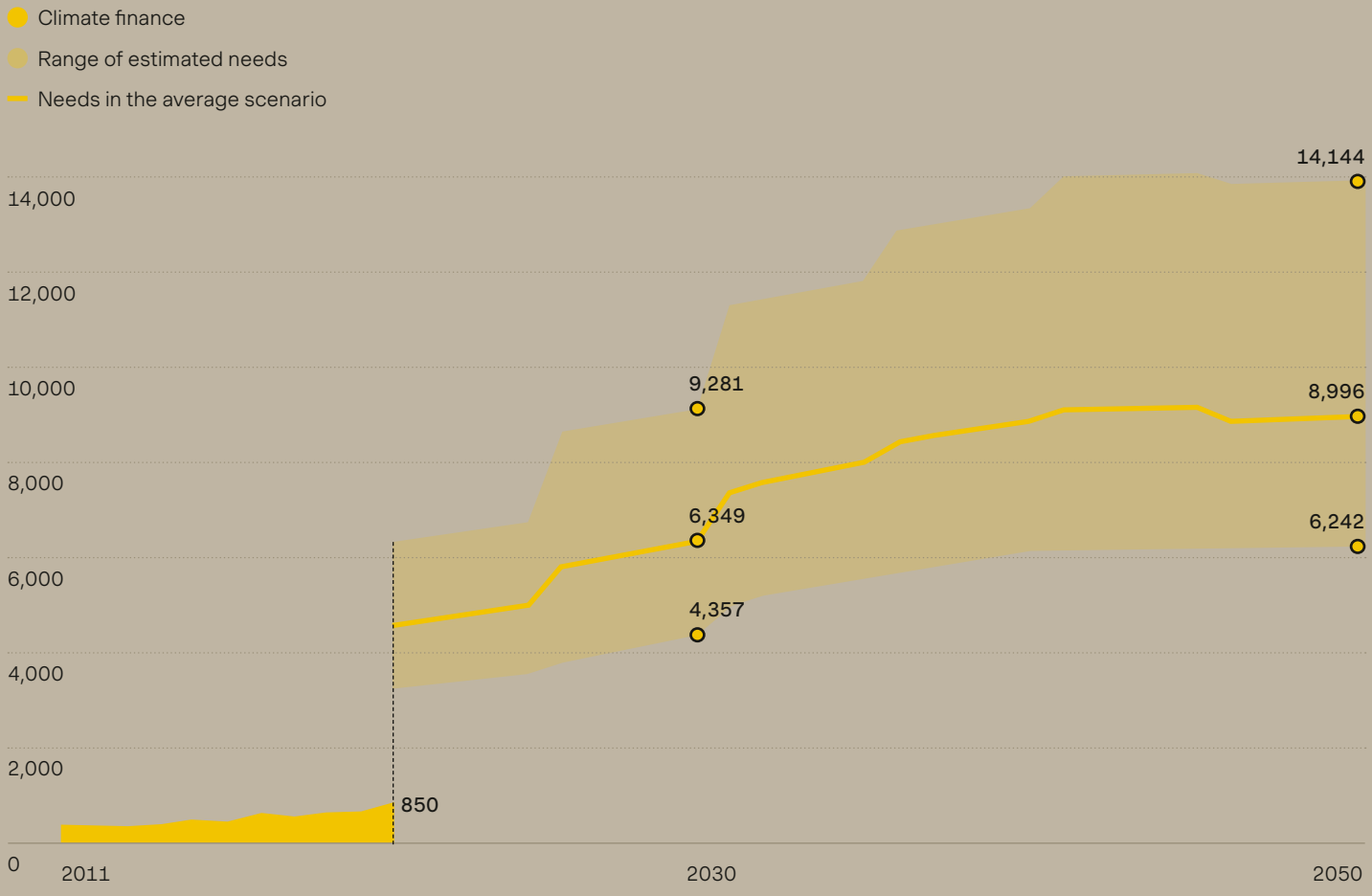
We're not there yet — and that's why climate finance needs to scale fast.

1 Climate Policy Initiative [B.Naran, J.Connolly, P.Rosane, D.Wignarajah, E.Wakaba, B.Buchner]. 2022. Global Landscape of Climate Finance: A Decade of Data 2011-2020

The VCM won't bridge the entire gap between where we are and where we need to be. Compliance markets, government programs like Article 6, and other mechanisms will always be crucial, and the highest estimated ceiling for the VCM still isn't high enough. By 2030, the most optimistic scenarios see the value of the entire market at $50 billion — an incredible expansion from the estimated $2 billion it's worth today, but a far cry from the trillions we need.[2]

Still, private capital deployed in the VCM has the potential to flow much more quickly than other sources. Governments, for example, often have long legislative runways to unlock funds, and then relatively long processes to dispense them. When businesses purchase meaningful amounts of carbon credits, it's a powerful demand signal that can spur the rapid scale-up of climate solutions. Those dollars hire workers, put resources into action, and break ground on projects.

The gap between where we are in climate finance and where we need to be[1]



Source: Climate Policy Initiative

2 Blaufelder, Christopher, Cindy Levy, Peter Mannion, and Dickon Pinner. 2021. "Carbon credits: Scaling voluntary markets." *McKinsey.*

So far, that potential has yet to be fully tapped. Demand for carbon credits has been unnaturally constricted by buyer hesitancy. That's due to a range of factors, from negative press to macroeconomic conditions constricting budgets, but also because education hasn't kept pace with how quickly the market landscape has evolved.

That's what this guide is designed to address for three groups of buyers:

01
First-time carbon credit buyers

02
Repeat buyers looking to improve their climate strategy

03
Experienced market actors concerned about long-term prices and access

Each of the three sections will:

- Explain the risks and benefits of purchasing carbon credits
- Provide a strategic pathway to maximizing climate impact and mitigating risk
- Offer a tactical buying checklist to corporate sustainability leaders

Aggressive action is needed now from corporate climate actors to scale the size of the VCM and by extension the impact of climate solutions. Hesitation won't ensure a livable future, and lack of education about the mechanics and benefits of carbon credits shouldn't be an excuse.

Stage 01

I'm new to carbon markets: An introduction to carbon credits

What are carbon credits?

If you've heard of carbon credits, you've likely heard their other name: offsets. That term refers to the practice of using carbon credits to "offset" your own carbon emissions as part of a climate claim like "carbon neutral" or "net zero."

However, compensating for unabated emissions isn't the only — or even the main — purpose of carbon credits.

A carbon credit is a market-based tool to generate revenue for climate solutions.

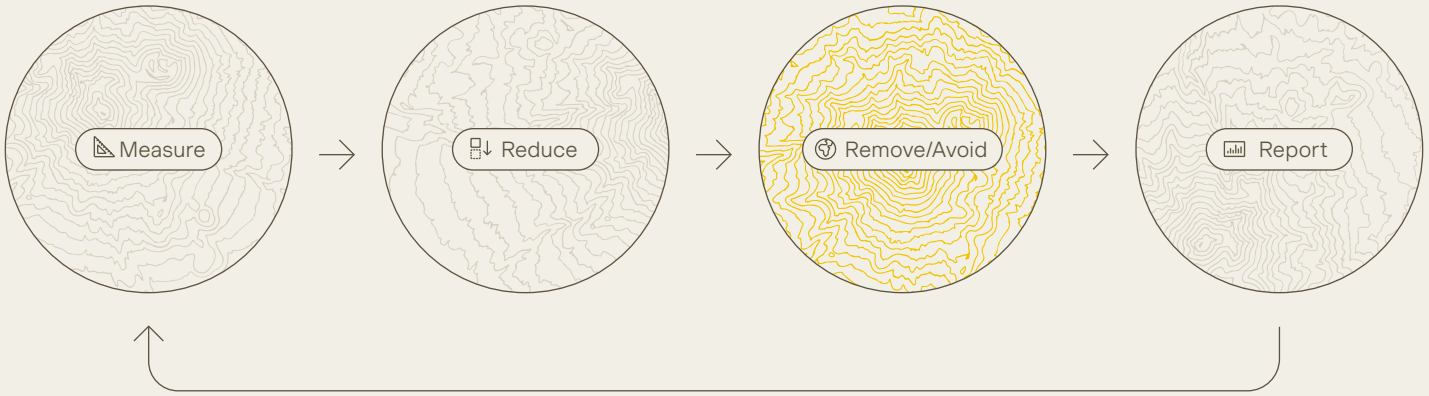
Because there's no universal, global mechanism that enacts a real-world price on the harmful effects of greenhouse gas emissions, economies aren't able to "internalize" the present and future consequences of climate change into the prices of goods and services. It also means projects and technologies that avoid emissions or remove them from the atmosphere (like landfill gas capture, reforestation, enhanced rock weathering, and dozens more) lack commercial incentives.

Each carbon credit provides that incentive by acting as a type of guarantee or contract that one metric tonne of CO_2e ("e" for "equivalent" greenhouse gasses of other kinds) has been avoided or removed. When you buy a credit, you give carbon credit suppliers the ability to monetize climate solutions.

So, carbon credits can be used as part of compensation schemes — in other words, systems to account for emissions and then offset them using credits — or as one of the easiest ways to take immediate climate action by supporting projects that are already removing or avoiding carbon.

A science-based climate strategy

Many companies follow this order of operations. Measuring and reducing corporate emissions is the foundation of a science-based sustainability strategy. Carbon credits come in during the "Remove/Avoid" phase, either to offset a portion of emissions or to contribute to climate solutions.



How we know a carbon credit equals a tonne of CO_2e

The confidence we have that a carbon credit equals the tonne of CO_2e the project is claiming to remove or avoid is called "integrity" at Patch, though you may also hear others say "quality." When a credit has very high integrity, we have very high confidence that the promised climate impact has occurred. Since planet-wide systems are hard to project with certainty, carbon credit projects rely on sophisticated science to judge integrity.

Assessing the climate impact of a forest that would have been clearcut, for example, means accurately assessing the carbon stored in the forest, how long it's stored, the cascading effects on the local environment, and much more.

This scientific process occurs at multiple stages during the lifecycle of a carbon credit.

Scientific process throughout the lifecycle of a carbon credit

Project design

Before a project can produce a carbon credit, it must develop or align with a methodology for how the project will measure and monitor carbon, create a project design document that describes how the project will adhere to the methodology, and verify the climate impact once the mitigation activity has occurred.

Measuring, reporting, and verification (MRV)

Projects must also submit to external review from third-party validation and verification bodies (VVBs) to ensure the promised climate action is really happening, a process known as MRV. Different types of solutions require different MRV methods. Some forestry projects, for example, rely on drone and satellite surveillance, AI analysis, and complex modeling.

Registration, issuance, and retirement

In addition to the scientific oversight required to ensure integrity, carbon credits also need rigor to secure the transaction against risk. Projects are registered in third-party databases, which issue credits, track ownership, and log retirement once the climate action has occurred to protect against double-counting.

Because carbon credit projects encompass such a wide variety of mechanisms, each type of carbon credit should be judged according to the rigor of its project design and MRV, and tracked from registration through retirement. It's very likely you'll need expert advice to help you assess those criteria and apply them to your carbon credit purchasing plan.

Beyond that, you can reduce your risk exposure by closely scrutinizing third-party ratings, project details, and purchasing through a trusted marketplace with strong requirements for integrity.

Trust and safety
Patch protects buyers from risk using redundant layers of protection.

01 Stringent project acceptance criteria

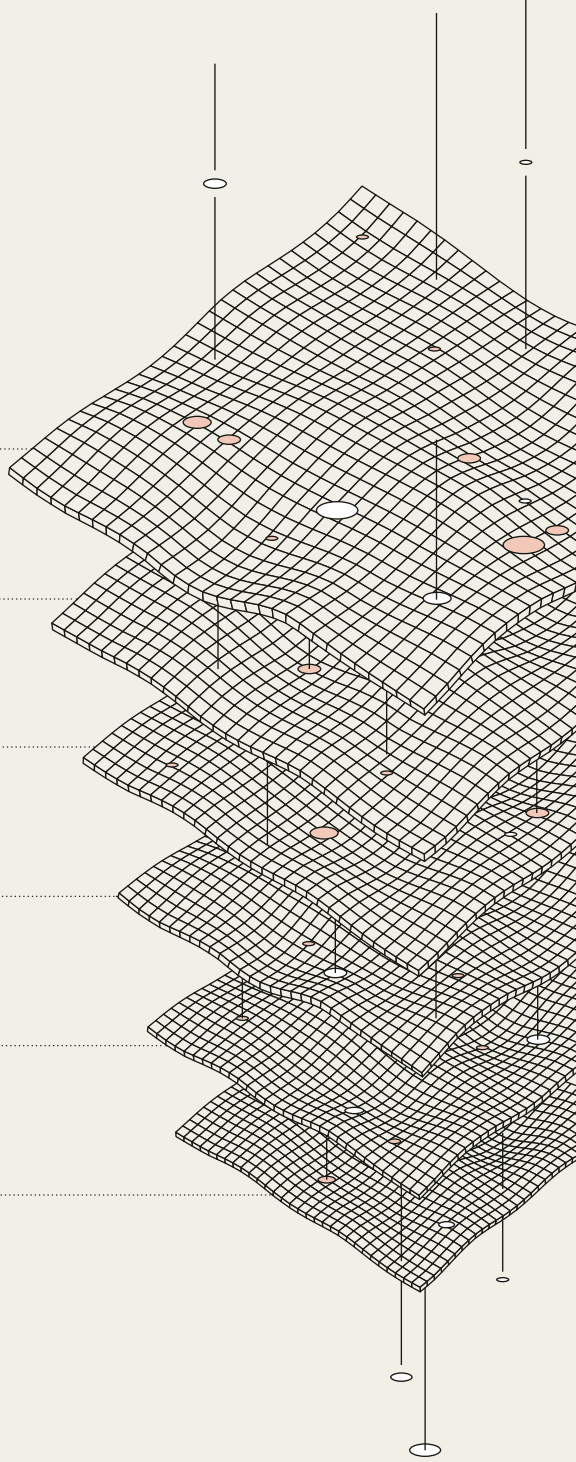
02 Transparent project data including ratings, analysis, and scientific reviews

03 Expert, personal guidance from our Climate Solutions team

04 Ease of diversification

05 Protection against delivery risk

06 Continuous iteration and communication as science and standards evolve



Read more about Patch Trust and Safety

The different attributes of carbon credits

Carbon credits from different projects aren't interchangeable. The process through which CO_2e is removed or avoided can vary greatly between approaches, imbuing each project's carbon credits with its own attributes.

Just as the project determines the MRV methodology, it also determines various attributes that impact integrity, pricing, and desirability for buyers.

In addition to these attributes, each carbon credit could have numerous co-benefits that are desirable to purchasers. Often, buyers are looking to support projects that are located in their geography to tell a story about funding climate action in their local community. Or they may also want to support indigenous land management or biodiversity conservation.

These co-benefits can be a huge part of what makes a project exciting both to companies and their customers. Attributes like additionality and negativity are essential to a high baseline for integrity, but co-benefits are also a key consideration to a best-practice climate strategy.

These are five of the primary attributes of carbon credits:

Real and verifiable
The project is using a scientifically rigorous methodology for monitoring and verification that has been reviewed by a group of experts in an appropriate field related to the project. There is a plan in place to re-review the methodology on a regular cadence.

Additionality
The project is creating climate impact that wouldn't have occurred otherwise. Some projects (for example, certain types of renewable energy), once relied on credits to achieve commercial viability. Now that they have, they're no longer seen as additional.

Permanence
Also known as "durability," this measures the amount of time (in years) the carbon will be mitigated from atmospheric circulation. Forests, for example, store carbon naturally for often less than 100 years, while geologic storage can store it for thousands of years.

Leakage
Without proper care, some projects can unknowingly contribute to increasing or shifting emissions elsewhere. For example, protecting one acreage of forest could simply result in another being deforested. Rigorous project design and MRV is needed to ensure this doesn't occur.

Negativity
The project results in a net negative reduction in atmospheric carbon dioxide, meaning it doesn't generate more emissions to create the credit than the credit itself. This means emissions from transporting sequestered carbon as well as the footprint of energy used to power the project needs strict accounting.

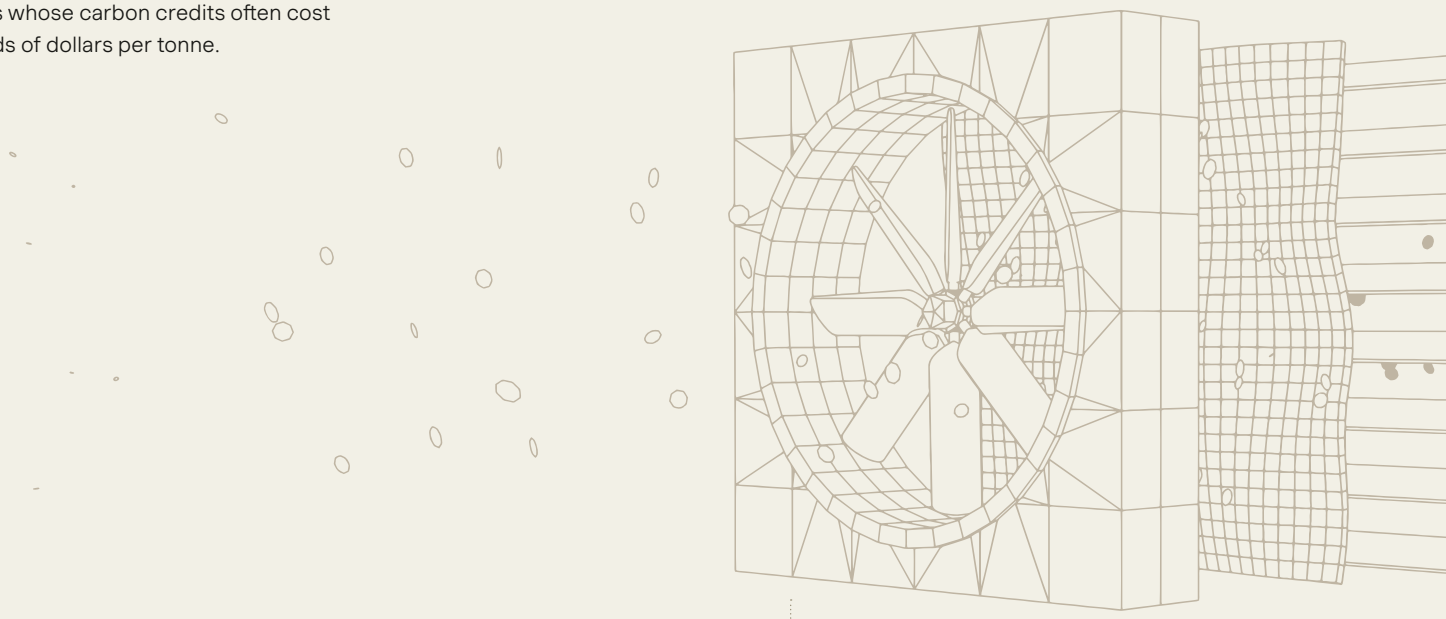
Enforceability
The project is not double-counted. If multiple parties claim credit for the same carbon mitigation, it can erode confidence in the market and undermine carbon accounting.

Why carbon credit prices can vary widely

Just as MRV and attributes vary by project, prices do too. Those prices are informed by a variety of factors, including how expensive it is for a project to produce each credit. Early stage engineered solutions that have yet to scale up production may have fewer tonnes and higher overhead costs, resulting in higher prices per tonne. Many of those cutting-edge projects have highly accurate tools for measuring permanence, as well as the ability to store the carbon for millennia. That can result in higher demand for those credits, putting more upward pressure on prices. If the supply of those credits were to scale up, it would keep prices in check, though demand could also increase in the future as the market grows.

Direct air capture projects and carbon injection into concrete are two examples of projects whose carbon credits often cost hundreds of dollars per tonne.

Typically (though not always), credits that are cheaper tend to carry more risk from an integrity perspective. That relationship is not necessarily causal. As we mentioned earlier, establishing certainty in MRV is simpler in some methodologies than others. Recently, negative headlines around carbon credits have centered largely on certain REDD+ credits, which disincentivize deforestation, and often cost under $10 per tonne. Because REDD+ projects can sell credits against the carbon avoided from large acreages of forests, supplies are much greater compared to projects that have yet to scale. At the same time, the nature of REDD+ projects make it harder to measure and verify the attributes of the carbon credits. High supply plus demand curbed by buyer hesitancy equals lower prices.

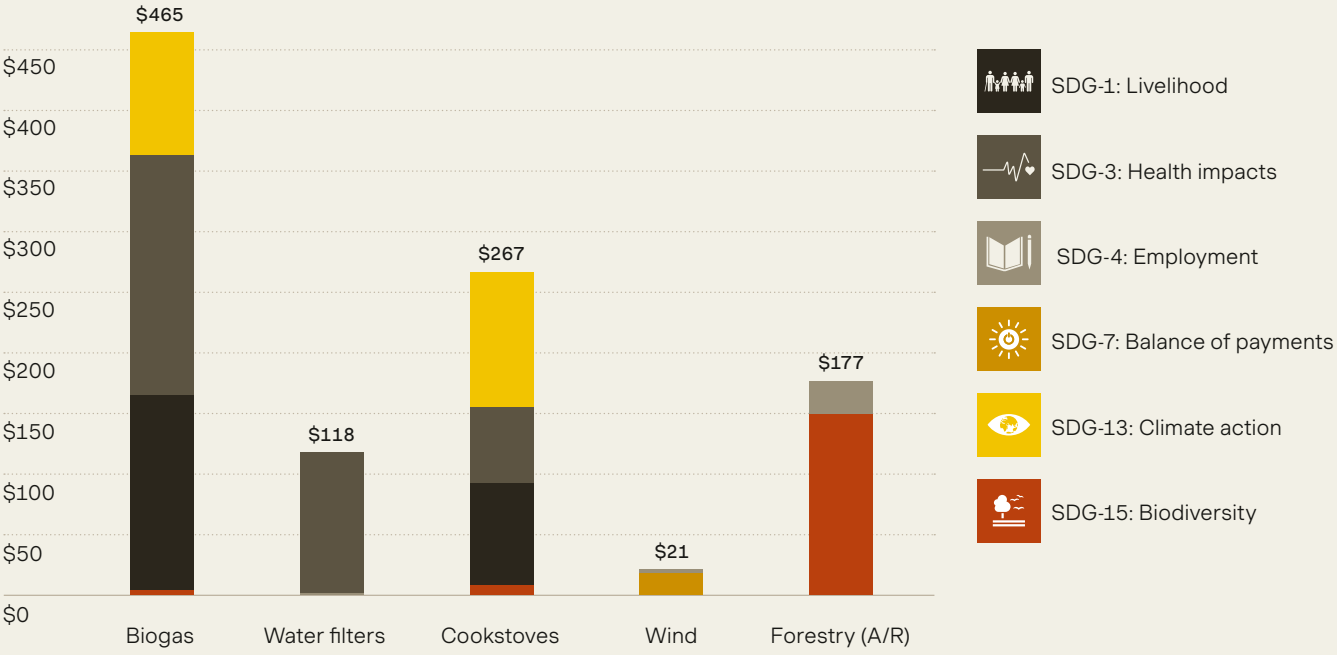


Direct air capture
A technology that uses chemical or physical processes to extract carbon dioxide from the air

Furthermore, it's critical to consider the impact of the project you fund through carbon credits — in other words, the "climate ROI." Gold Standard, a carbon credit standard and registry, looks at the economic output of several types of climate projects across the U.N.'s Sustainable Development Goals (SDGs).[3]

But beyond unit economics and risk, higher prices paid also reflect a forward-looking vision of climate finance. We know several orders of magnitude more funding is needed to scale carbon removal in particular to about 10 gigatonnes permanently sequestered per year by 2050.[4] The credits you choose to fund represents a powerful demand signal for those approaches. Buying now is a chance to accelerate climate solutions toward scale.

Monetary value of project SDGs per tonne of avoided emissions[3]



Source: Gold Standard

3 "CARBON PRICING: Why do prices vary by project type?" 2019. The Gold Standard.

4 Smith, S. M., O. Geden, G. F. Nemet, M. J. Gidden, W. F. Lamb, C. Powis, R. Bellamy, et al. 'The State of Carbon Dioxide Removal - 1st Edition'. The State of Carbon Dioxide Removal, 2023.

Three takeaways

01 Carbon credits are an effective mechanism for creating scalable commercial viability for projects that are crucial to rebalancing the planet.

02 No two projects have identical attributes, so complex systems of verification and validation, MRV, and transactional guardrails are needed to ensure each credit equals one tonne of CO_2e avoided or removed.

03 Purchasing credits with stronger claims of integrity can protect your company against risk, as well as accelerating climate solutions by signaling demand for those projects.

Case study: EQT

Prior to working with Patch, EQT had compensated for their unavoidable emissions using mostly traditional credits, such as reforestation projects and wind farms.

In order to align to their brand as a trailblazer in sustainability and further differentiate from their peers in private equity, EQT looked to more cutting-edge carbon credit projects.

Patch helped EQT think creatively about the types of credits to buy — credits in line with the company's vision and progressive approach. In 2021, these included novel technologies, such as bio-oil and concrete mineralization.

"While we made sure that every carbon credit project we chose was both certified and high in quality, we wanted to increase our exposure to more forward-thinking, permanent carbon removal solutions that have more recently come onto the scene."

Julia Wikmark
Head of Corporate Sustainability, EQT

EQT

Checklist for creating a carbon credit strategy

A note on emissions reductions
Measuring and reducing your corporate carbon footprint is absolutely essential to maintaining a credible and effective climate strategy.

For many claims, it's also a precursor to using carbon credits to reduce a footprint.

Reducing emissions can happen in parallel to funding climate solutions using carbon credits.

For companies with relatively large footprints and low net profits (such as industrials, transportation, energy), most — if not all — resources should be focused on reduction.

Companies with smaller footprints and larger net profits (banks, software, financial services) have the opportunity to be much more aggressive investing in carbon credits in addition to reducing emissions where they can.

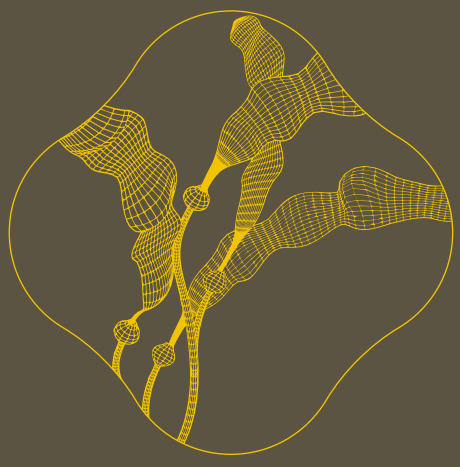
In contribution models, however, a company's carbon footprint is decoupled from its carbon credit strategy.

Find a carbon accounting partner

- [ ] Align on a sustainability budget — either an annual lump sum or a per-tonne dollar amount (read our climate budgeting guide for tactical advice)
- [ ] Set a climate commitment. Patch recommends your commitment has:
  - [ ] A net-zero aligned decarbonization target
  - [ ] A near-term goal to begin decarbonizing
  - [ ] Investment in carbon credits (read our climate commitments guide for more info)
- [ ] Determine your carbon credit strategy (compensation or contribution, preferred project types, a portfolio approach — see Stage 02 of this guide)
- [ ] Seek out expert guidance on carbon markets, project types, ratings, MRV and co-benefits to establish a set of criteria to guide your carbon credit buying
- [ ] Purchase carbon credits
- [ ] Check in annually on your progress and improvement, and set new short-term targets

Stage 02

I've purchased carbon credits before: A portfolio approach



The state of risk in the voluntary carbon market

The voluntary carbon market (VCM) is sometimes characterized as the "wild west," since there's no **centralized**, **global enforcement** of standards:

Centralized: Without a single, unified set of standards that applies to all parties on both the supply and demand side of the VCM, there's a wider range of project integrity. Suppliers are burdened to choose among the various pathways for validation, and buyers are sometimes paralyzed by risk — or even the perception of risk. The market as a whole is slowed by confusion and complexity.

Global: The VCM can trace its roots to around the time of the Kyoto protocol in the 1990s, as non-state actors looked for a way to participate in the United Nations' offsetting schemes and certify their work on carbon reduction and removal. As a grassroots movement, this enabled the VCM to grow rapidly — but unevenly. As a result, VCM policy varies from country to country, further fragmenting the market.[5]

Enforcement: The Kyoto protocol established a compliance mechanism for signatory nations to participate in carbon offsetting and trading, which includes an enforcement branch.[6] The VCM — as implied by the name — is voluntary. As such, the consequences for bad actors are also voluntary: greenwashing accusations driven by media and activists, loss of validation (such as SBTi Net-Zero), and customer churn. Of course, the consequences to the planet are not voluntary.

But the "wild west" metaphor calls to mind a type of lawlessness or chaos that isn't characteristic of the modern VCM. In fact, as carbon credit buyers gain experience with the landscape of methodologies, standards, policies, and science, they often feel overwhelmed rather than underwhelmed.

There are VCM standards in place for traditional projects and methodologies (e.g. Verra, Gold Standard), standards for cutting- edge project types (e.g. Puro.Earth), standards for specific project types (e.g. European Biochar Certificate), standards for standards (e.g. ICROA), standards for how corporations deploy carbon credits towards meeting long-term climate goals (e.g. VCMI, SBTi), and standards for the types of credits that corporations can use to meet those climate goals (e.g. Climate Neutral).

Because these standards have different areas of focus, they cover different criteria, from project design and carbon measurement to co-benefits, governance, and even a project's capacity to scale. Some of these leading standards have substantial overlap. Others do not.

And they're constantly — and rapidly — evolving.

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5 "The Evolving Voluntary Carbon Market." 2023. International Emissions Trading Association.

6 Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 10, 1997, 2303 U.N.T.S. 162.

The standards landscape today

Taken as a whole, this standards ecosystem actually represents the best available science on credit integrity, project efficacy, and how organizations should engage with the VCM. Each one improves our baseline and understanding of project risk. Each adds value to the market.

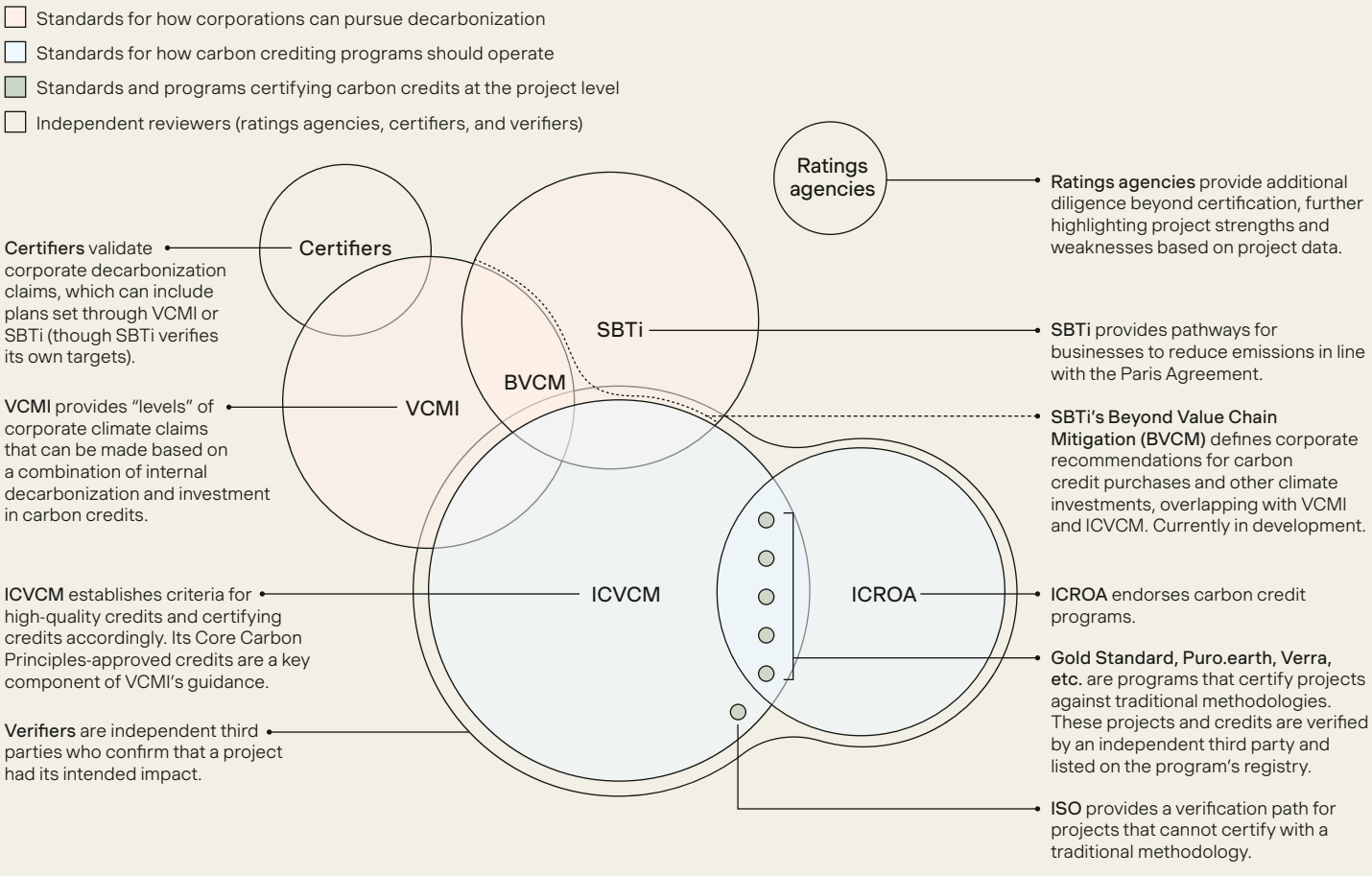
Organizations that engage with the VCM do so on their own due diligence, or in consultation with bodies like SBTi, individual advisors, or companies like Patch. Yet even with due diligence and professional advice, it can still be difficult for a buyer to understand the entire standards landscape as a whole.

These standards represent real risk reduction as buyers and suppliers adopt them, but they're still not centralized.

As a carbon credit buyer, this fragmentation makes it difficult to understand which criteria really matter in ensuring the efficacy of your carbon credit investment. That can create hesitancy in the market at a time when climate solutions are in urgent need of the financing carbon credits provide.

The solution to fragmentation is synthesis.

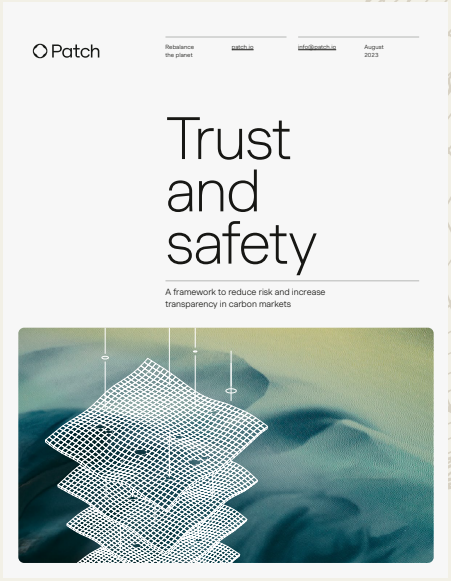
Key roles and overlaps in the shifting VCM ecosystem



Patch's project acceptance criteria

To set a high bar for the integrity of projects listed on our platform, Patch's acceptance criteria synthesizes many of the leading standards, drawing from ICVCM's Core Carbon Principles, VCMI's Claims Code of Practice, and others.

Download our Trust & Safety whitepaper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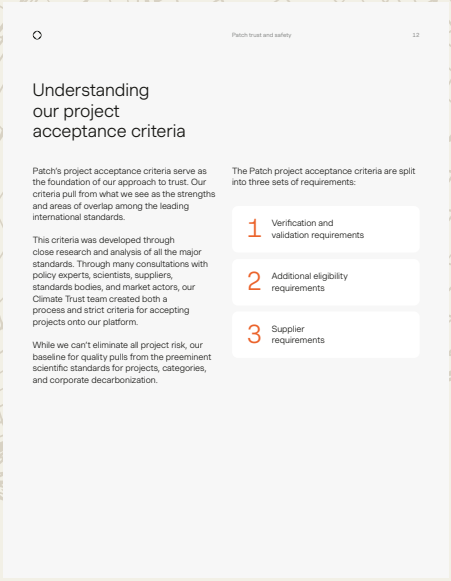
Trust and safety

A framework to reduce risk and increase transparency in carbon markets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Understanding our project acceptance criteria

Patch's project acceptance criteria serve as the foundation of our approach to trust. Our criteria pull from what we see as the strengths and areas of overlap among the leading international standards.

This criteria was developed through close research and analysis of all the major standards. Through many consultations with policy experts, scientists, suppliers, standards bodies, and market actors, our Climate Trust team created both a process and strict criteria for accepting projects onto our platform.

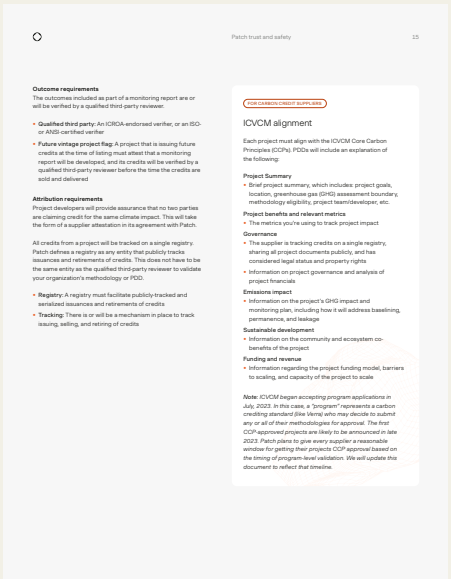
While we can't eliminate all project risk, our baseline for quality pulls from the preeminent scientific standards for projects, categories, and corporate decarbonization.

The Patch project acceptance criteria are split into three sets of requirements:

1 Verification and validation requirements

2 Additional eligibility requirements

3 Supplier requirements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Outcome requirements
The outcomes included as part of a monitoring report are or will be verified by a qualified third-party reviewer.

- **Qualified third party:** An ICROA-endorsed verifier, or an ISO- or ANSI-certified verifier
- **Future vintage project flag:** A project that is issuing future credits at the time of listing must attest that a monitoring report will be developed, and its credits will be verified by a qualified third-party reviewer before the time the credits are sold and delivered

Attribution requirements
Project developers will provide assurance that no two parties are claiming credit for the same climate impact. This will take the form of a supplier attestation in its agreement with Patch.

All credits from a project will be tracked on a single registry. Patch defines a registry as any entity that publicly tracks issuances and retirements of credits. This does not have to be the same entity as the qualified third-party reviewer to validate your organization's methodology or PDD.

- **Registry:** A registry must facilitate publicly-tracked and serialized issuances and retirements of credits
- **Tracking:** There is or will be a mechanism in place to track issuing, selling, and retiring of credits

FOR CARBON CREDIT SUPPLIERS

ICVCM alignment

Each project must align with the ICVCM Core Carbon Principles (CCPs). PDDs will include an explanation of the following:

Project Summary
- Brief project summary, which includes: project goals, location, greenhouse gas (GHG) assessment boundary, methodology eligibility, project team/developer, etc.

Project benefits and relevant metrics
- The metrics you're using to track project impact

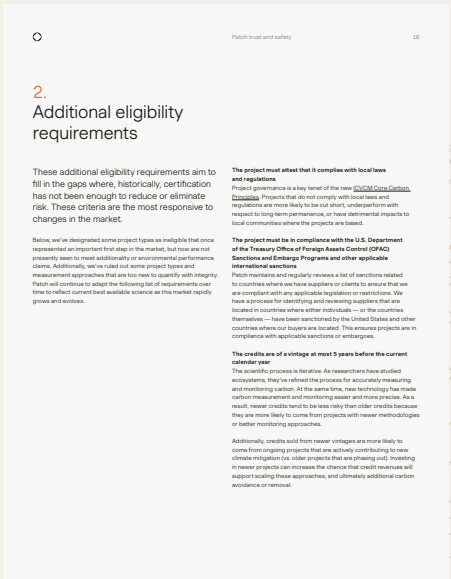
Governance
- The supplier is tracking credits on a single registry, sharing all project documents publicly, and has considered legal status and property rights
- Information on project governance and analysis of project financials

Emissions impact
- Information on the project's GHG impact and monitoring plan, including how it will address baselining, permanence, and leakage

Sustainable development
- Information on the community and ecosystem co-benefits of the project

Funding and revenue
- Information regarding the project funding model, barriers to scaling, and capacity of the project to scale

Note: ICVCM began accepting program applications in July, 2023. In this case, a "program" represents a carbon crediting standard (like Verra) who may decide to submit any or all of their methodologies for approval. The first CCP-approved projects are likely to be announced in late 2023. Patch plans to give every supplier a reasonable window for getting their projects CCP approval based on the timing of program-level validation. We will update this document to reflect that timeline.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2. Additional eligibility requirements

These additional eligibility requirements aim to fill in the gaps where, historically, certification has not been enough to reduce or eliminate risk. These criteria are the most responsive to changes in the market.

Below, we've designated some project types as ineligible that once represented an important first step in the market, but now are not presently seen to meet additionality or environmental performance claims. Additionally, we've ruled out some project types and measurement approaches that are too new to quantify with integrity. Patch will continue to adapt the following list of requirements over time to reflect current best available science as this market rapidly grows and evolves.

The project must attest that it complies with local laws and regulations
Project governance is a key tenet of the new ICVCM Core Carbon Principles. Projects that do not comply with local laws and regulations are more likely to be cut short, underperform with respect to long-term permanence, or have detrimental impacts to local communities where the projects are based.

The project must be in compliance with the U.S. Department of the Treasury Office of Foreign Assets Control (OFAC) Sanctions and Embargo Programs and other applicable international sanctions
Patch maintains and regularly reviews a list of sanctions related to countries where we have suppliers or clients to ensure that we are compliant with any applicable legislation or restrictions. We have a process for identifying and reviewing suppliers that are located in countries where either individuals — or the countries themselves — have been sanctioned by the United States and other countries where our buyers are located. This ensures projects are in compliance with applicable sanctions or embargoes.

The credits are of a vintage at most 5 years before the current calendar year
The scientific process is iterative. As researchers have studied ecosystems, they've refined the process for accurately measuring and monitoring carbon. At the same time, new technology has made carbon measurement and monitoring easier and more precise. As a result, newer credits tend to be less risky than older credits because they are more likely to come from projects with newer methodologies or better monitoring approaches.

Additionally, credits sold from newer vintages are more likely to come from ongoing projects that are actively contributing to new climate mitigation (vs. older projects that are phasing out). Investing in newer projects can increase the chance that credit revenues will support scaling these approaches, and ultimately additional carbon avoidance or removal.

The value of a portfolio approach to carbon credits

Synthesis can protect against risk when it comes to the various standards in much the same way as diversification can when choosing carbon credits to purchase. Combining different project technology types and approaches can provide a wider variety of benefits, as well as hedging against the different kinds of risks each type has.

Let's consider just a few:

Enhanced rock weathering

Enhanced rock weathering (ERW) mineralizes carbon in stable silicate minerals found in olivine, basalt, and several others. Projects grind up these minerals and spread them on farmland or coastland, where they naturally interact with the atmosphere, storing the carbon and running off into the ocean where it's ultimately sequestered.

Biochar

Biochar sequesters carbon by heating biomass (like wood and crop residue) in an oxygen-poor environment. This process, called pyrolysis, transforms the biomass into a stable, carbon-rich charcoal without releasing emissions into the atmosphere.

REDD+

REDD+ (Reducing Emissions from Deforestation and forest Degradation, plus sustainable forest management) was established by the U.N. as a system to incentivize protecting forests and ecosystems critical to mitigating climate change using carbon credits.

We'll dive into the details on the next page

Enhanced rock weathering

BENEFITS

Permanence: ERW can theoretically sequester carbon for millions of years in stable minerals at the seafloor.

Soil health: When used on farmland, minerals used for ERW improve soil health and crop yields.

Ocean deacidification: ERW transforms atmospheric carbon into bicarbonates, which are basic. As they dissolve into seawater, they counter ocean acidification and enable the seas to absorb more carbon.

RISKS

Environmental impacts: ERW projects must make sure they're not negatively impacting the natural ecosystems in which they're deployed, and that the minerals used are not causing additional extraction.

Monitoring: It's scientifically complex to accurately measure the rate of sequestration as well as the stability of the minerals in their final state. Credible monitoring and baselining is critical for ERW projects.

Additionality: Because ERW minerals have desirable uses in farming, proving the project would not have happened without the revenue from carbon credits is essential.

Biochar

Permanence: Biochar has two carbon sink pools: polycyclic aromatic carbon (PAC) and semi-persistent carbon (SPC). SPC is durable for 50-100 years, PAC can persist for 1000 years in many soil types and climates.

Renewable energy: Bio-oil and syngas are byproducts of producing biochar, and can be used to generate heat and electricity.

Biochar uses: Biochar can be used for water filtration, as a soil amendment, or added to animal feed to reduce emissions from livestock agriculture and improve animal health.

Additionality: Accurately estimating what would have happened to biomass feedstock in the absence of the biochar project is key to calculating the additionality of the carbon credits.

Permanence: While biochar has potentially high permanence — especially PAC — it is sequestered in soil. As such, both human and natural activity can cause the carbon to be prematurely released back into the atmosphere.

Leakage: Biochar projects need to measure and protect against causing emissions leakage from changes in land management outside the project area, such as sourcing new biomass rather than existing stock. Also, protecting people's food sources from use as biomass is a concern.

REDD+

Negativity: The earth's forests naturally absorb a net 7.6 billion tonnes of CO_2 per year, approximately one-and-a-half times the annual emissions of the U.S.

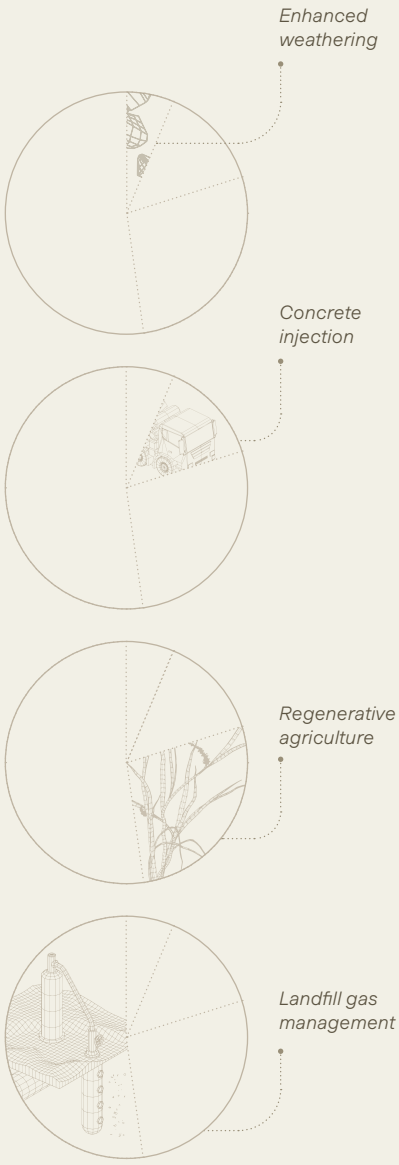
Biodiversity: 80% of terrestrial species live in forests, many of which are the most diverse ecosystems on the planet. Preventing deforestation is critical to preserving biodiversity.

Local benefits: 1.6 billion people (60 million of whom are indigenous peoples) depend directly on forests. Revenues from REDD+ credits can provide crucial income to local communities managing the land.

Additionality: REDD+ projects rely on modeling future human and ecosystem behavior, which can't be done with 100% accuracy. Even the best models have some uncertainty, though baselining is improving constantly.

Permanence: As trees die and decompose, carbon is released into the atmosphere. REDD+ projects sequester carbon for decades, and also have risk of "reversal" due to logging, clearcutting, wildfires, droughts, and floods.

Leakage: Protecting a certain acreage of forest may not stop deforestation, but instead transfer it to a different acreage. Careful project design and monitoring is needed to prevent this leakage.



It's impossible to fully eliminate risk from any transaction, and carbon credits are no exception. In other markets, like the stock market for example, buyers hedge against the risk of any single investment failing through diversification. Savvy carbon credit buyers approach the VCM the exact same way — by carefully gauging their risk tolerance, and aligning their carbon credit purchases to their own thresholds and red lines.

By spreading your investment across multiple projects and especially project types, you can reduce your overall risk should any single project underdeliver.

Patch always recommends taking a portfolio approach when buying carbon credits.

In the VCM, a portfolio approach has benefits beyond risk reduction. Since prices can vary quite a bit by project type, a portfolio can allow buyers to blend down the overall price-per-tonne by combining higher and lower priced credits.

Most importantly, building a portfolio spreads funding to a wider variety of projects. We don't yet know which projects or approaches will ultimately make the greatest difference in mitigating climate change, so especially in this early stage, it's strategic to invest in scaling up a broad variety of solutions.

The Oxford Principles

The Oxford Principles for Net Zero Aligned Carbon Offsetting from Oxford University put forward a science-based approach to building a diversified carbon credit portfolio aligned to a long-term climate strategy.[7]

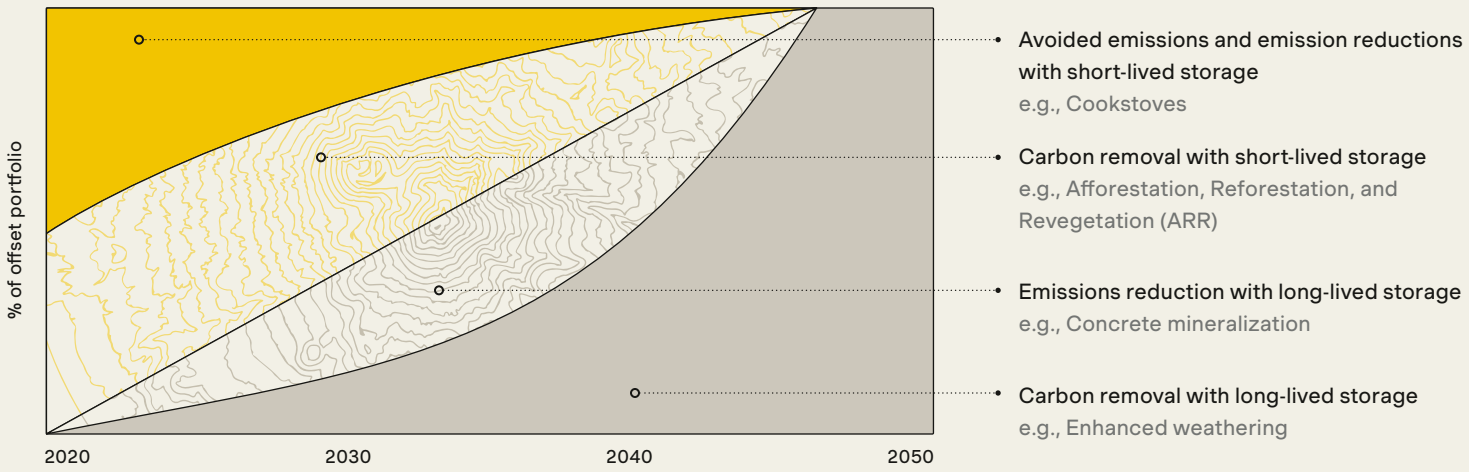
The glidepath visualized shows a general trend for how carbon credit purchases should be weighted over the next two decades. The importance of nature-based and energy efficiency approaches will gradually reduce, and as cutting-edge technologies like ERW scale, they'll further integrate. All of these approaches (and more) will play a role — but that role will change over time.

This path is partially prescriptive, but it's also based on forecasting the need for and the available supply of credits supporting each technology type. For example, carbon credits that subsidize more sustainable cookstoves in developing countries will become less and less additional over time as their manufacture and use scales up and normal commercial incentives take over. On one hand, that will necessarily reduce supply as carbon credits for those projects are no longer useful or desirable.

On the other end of the spectrum, novel engineered solutions with high permanence like ERW will only grow in available supply as the technology scales. Similarly, those types of extremely durable carbon removal credits will also be more desirable. By the mid-2040s, an Oxford Principles-aligned portfolio will entirely consist of removal projects with long-lived storage.

One thing it's important to consider is that cutting-edge technologies need carbon credit revenue today, both to reinvest in scaling the solution and as a signal of commercial demand to help raise capital. When constructing a forward-looking portfolio, you should consider sending that signal as part of your strategy.

Sample net-zero portfolio (per Oxford Principles)

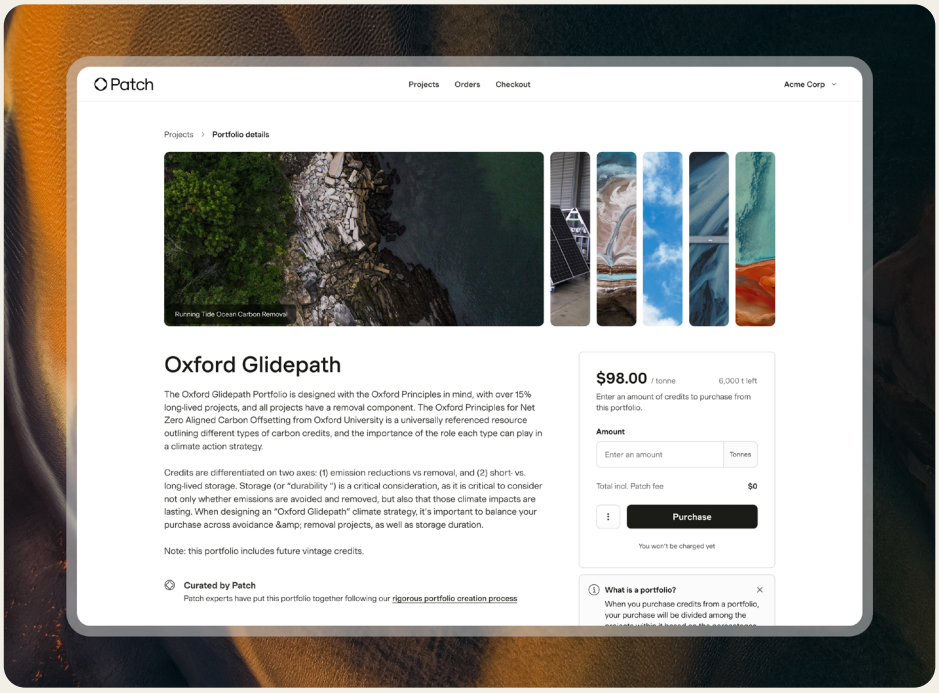


7 Mitchell, Eli. 2020. "The Oxford Principles for Net Zero Aligned Carbon Offsetting 2020." Smith School of Enterprise and the Environment.

Patch's Oxford Glidepath portfolio

Patch has curated pre-built portfolios available to purchase on our platform. Our Oxford Glidepath Portfolio is designed with the Oxford Principles in mind, with over 15% long-lived projects, and all projects having a removal component.

Read more about Patch custom portfolios



Three takeaways

01 The state of standards in the VCM today is robust, but complex and decentralized. Synthesizing them will help you reduce your risk exposure as you engage with carbon credits. You may need expert guidance to help do this.

02 Many — if not all — types of climate solutions will play a role in mitigating climate change. Each has unique attributes and advantages, as well as unique risks. A portfolio approach can spread funding to a wide variety of projects while hedging against buy-side risk.

03 Taking a forward looking view of your carbon credit portfolio construction will help you spend strategically so you can maximize your climate impact. Consider aligning your portfolio to the Oxford Principles or signaling demand for novel technologies.

Case study: Gorgias

In Summer 2023, Patch launched Portfolios, a mechanism for buyers to seamlessly purchase curated groups of credits. Each portfolio comprises a number of projects, diversified by mechanism, technology type, and geography. With the portfolio structure assigning a weight to each project, this created a blended average price for the portfolio. An investment into the portfolio would automatically assign funds to each developer at their specific weighting.

Gorgias, a technology company in the ecommerce vertical, purchased the Carbon Avoidance and Removal hybrid portfolio, which offers a 50/50 blend of avoidance and removal projects. In addition to supporting conservation, reforestation, and revegetation projects, this portfolio supports novel technologies including biochar and ocean-based carbon removal.

"We had done our research, and wanted to make a contribution to projects at around a $40 per tonne price point. Because we wanted to support traditional and frontier technologies, Patch was a great fit. The weighted price fits our requirements. Compared to buying directly from six developers, the process with Patch was fast and simple."

Brittany Walker
Impact Ambassador, Gorgias

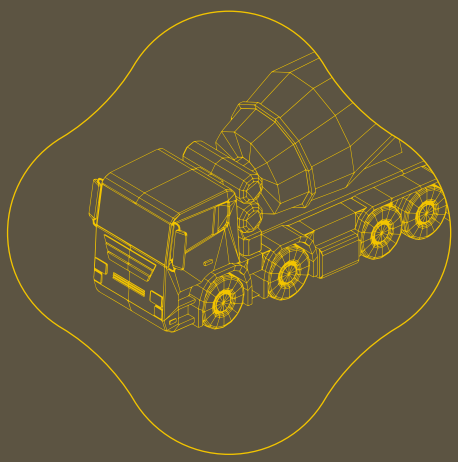
gorgias

Checklist for building a carbon credit portfolio

- [ ] Set goals for your carbon credit purchases as a part of your larger climate commitment
- [ ] Align on a target blended price-per-tonne budget across your portfolio
- [ ] Identify your organization's portfolio requirements (the types of projects you want to support, additional attributes or criteria to prioritize)
- [ ] Align on your risk tolerance to rule in or out the varying project types (what types and levels of risk are acceptable given your portfolio requirements)
- [ ] Align with a partner who can help you work through the standards to meet your climate commitment requirements
- [ ] Research projects and project types to understand attributes, ratings, and prices
- [ ] Purchase credits using a custom or pre-built portfolio (without portfolio software, diversifying your carbon credit purchases necessitates duplicating the transaction across each separate credit in your portfolio, which can be onerous)

Stage 03

I'm an experienced buyer: A long-term outlook on pricing and supply



Carbon credit pricing pressures

In 2021, the VCM quadrupled year-over-year — valuing $2 billion. By 2030, the size of the VCM could be worth between $10–40 billion.[8]

However, last year, demand for carbon credits dropped by about 4% year over year, with 155 million credits purchased and retired in 2022 versus 161 million in 2021. This was mostly due to fears over credit quality driven by high-profile exposés of Verra REDD+ credits. Combined with the collapse of the crypto bubble, which had collectively invested heavily in carbon credits, the drop in demand depressed prices for many nature-based carbon credits.[9] Despite the overall supply of REDD+ credits decreasing by 32%, buyers remained largely hesitant, with prices dropping below $2 on average for nature-based credits.[10]

Despite the recent price volatility, there's extremely good reason to believe in the near-term and long-term outlook for the VCM. Per Trove Research, the amount of capital investment going into carbon credit projects is five times greater than overall carbon credit sales. The primary market (i.e. only factoring in retired credits) was worth $1.5 billion in 2022, with capital investments adding up to $7.5 billion. For mature industries, that ratio is typically negative, with sales outpacing investment.

Nature-based carbon credit prices (USD)[10]

Source: CarbonCredits.com

8 Forest Trends' Ecosystem Marketplace. 2022. The Art of Integrity: State of Voluntary Carbon Markets, Q3 Insights Briefing. Washington DC: Forest Trends Association.

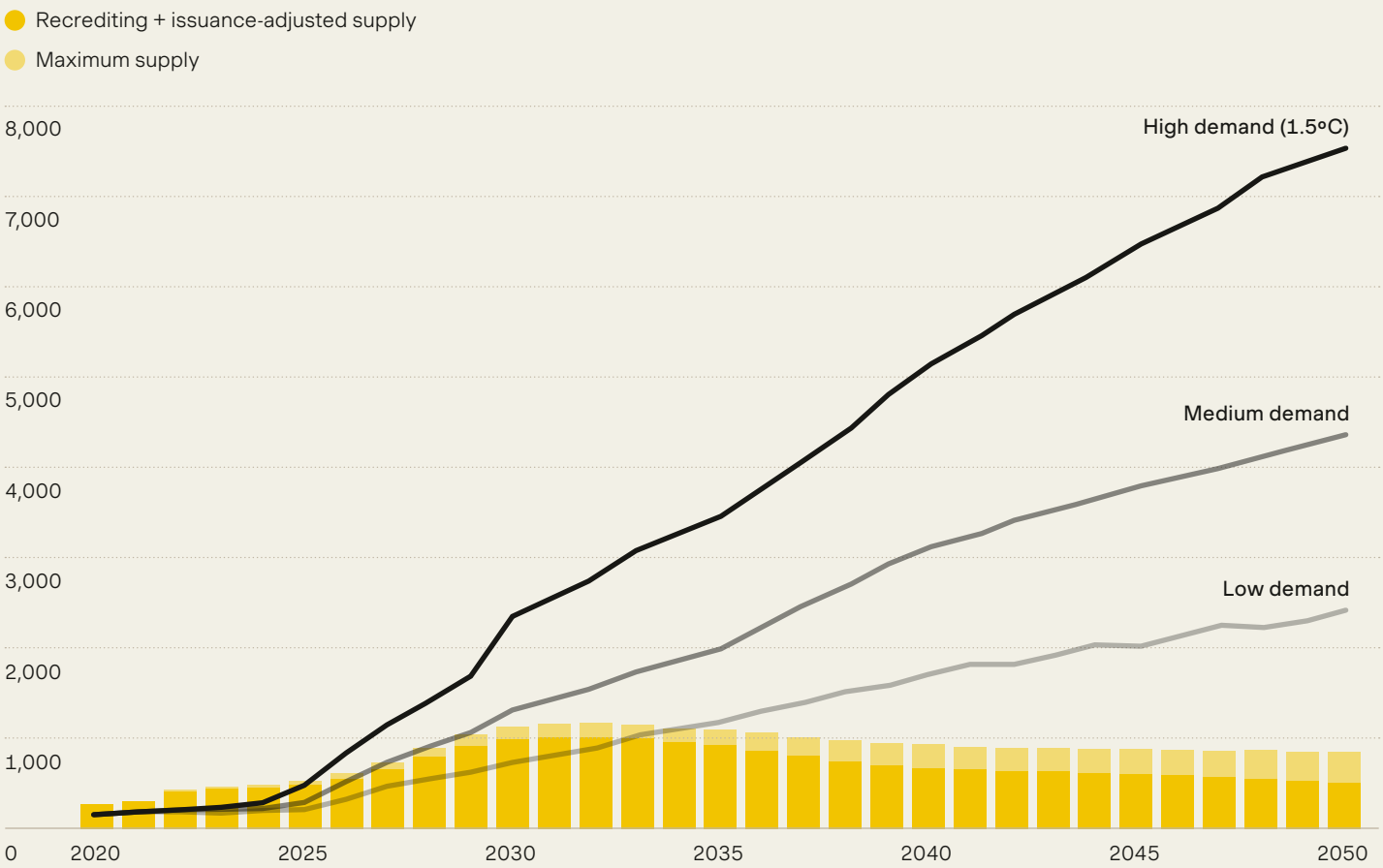
9 "Long-Term Carbon Offsets Outlook 2023." 2022. Bloomberg.

10 L, Jennifer. 2023. "The Collapse of NGEO Carbon Prices: An In-depth Analysis." CarbonCredits.com.

Moreover, projected demand is forcasted to skyrocket. From the same analysis, Trove Research estimated demand outstripping supply by 2030 in low-demand scenarios and sooner in demand scenarios aligned to a 1.5°C pathway.[11]

All signs point toward a major increase in price and an overall supply that could lag behind, making credit access a concern for companies in the near-term. In the next section, we'll examine reasons underlying the forecasted increase in demand.

Projected supply and demand — all credits ($MtCO_2e$/year)[11]



Demand includes potential demand from corporates net zero targets (SBTI and non-SBTI approved), carbon neutral claims, CORSIA, compliance schemes, and governments under Art 6.2/6.4. Supply includes registered and pipeline projects. By 2030 roughly half of credits supply will come from registered and half from pipeline projects

Source: Trove Research analysis ©Trove Research 2023

11 "Global Carbon Credit Investment Report." 2023. Trove Research.

Medium-term outlook and near-term acceleration

Consistently in our conversations with cutting-edge CDR project developers, they cite solving the demand side of the market as the greatest need to unlock the acceleration of capacity upon which a 1.5°C future is predicated.

Currently, buy-side demand in the VCM is behavioral, and therefore highly elastic (i.e. responsive to changes in other economic variables) — both to prices and to changes in consumer appetite for sustainable products, services, and brands. The supply of high-integrity carbon credits available on the VCM is less elastic, being constrained by (among other factors):

- Policy needs (like nationally determined contributions)
- Verification and validation demands and timelines
- Rising standards for integrity
- Nascency of technology
- Land use restrictions

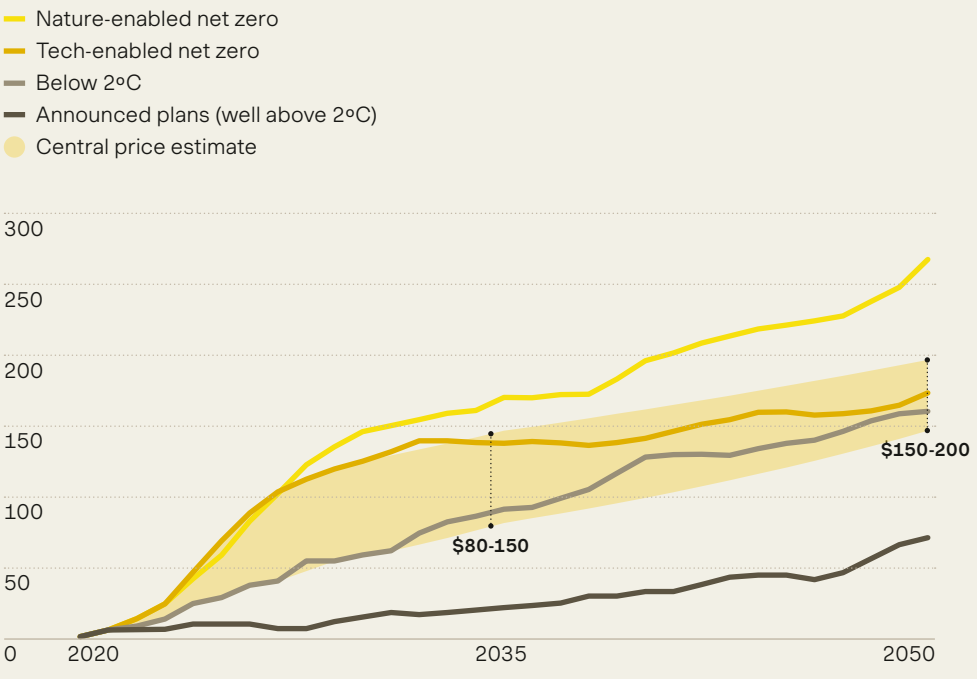
Fundamental demand (e.g. the need to meet a public-facing climate commitment) will grow as the incremental cost of reducing "last-mile" or hard-to-abate emissions grows, net-zero target deadlines approach, and pressure from investors and even regulatory bodies (like the SEC in the U.S.) ratchets up.

In this price outlook from EY Net Zero Centre, carbon credit prices are forecasted for four climate scenarios, with the central price estimate falling between $80 and $150 by 2035.[12]

The time is ripe for buyers to "solve the demand side" of the VCM and lock in prices and volumes before fundamental demand overtakes behavioral demand. Signing long-term commitments allows buyers to take advantage of low present-day prices and high available supply. It helps project developers scale up their capacity ahead of the projected demand increase.

Let's look at one method for companies to do just that.

Carbon credit price outlook, 2020-2050 (US$ per tonne of CO_2e)[12]



Source: EY

12 "Essential, expensive and evolving: The outlook for carbon credits and offsets." 2022. EY.

Offtake agreements in carbon markets

Common to the commodities sector (and mining in particular), offtake agreements are project financing schemes (or methods that unlock project financing) that allow buyers to pre-purchase goods that haven't been produced yet. For instance, prior to the construction of a new mine or semiconductor factory, a buyer could agree in advance to purchase a set quantity of minerals or microchips upon completion for years into the future.

The purpose of an offtake agreement is to provide a guaranteed market for the producer's output and ensure stability and predictability in the sales and revenue streams. In turn, the buyer is able to secure a reliable source of supply for the commodity they need.

Last year, Patch signed offtake agreements with companies including Bain & Company and with Walk it Back, facilitating their long-term access through the end of the decade to a portfolio of innovative project developers that includes CarbonCure Technologies (carbon reduction and removal through mineralization in concrete), Mission Zero Technologies (direct air capture), Running Tide (multi-pathway ocean carbon removal), and Vesta (coastal carbon capture).

In 2023, Microsoft signed an 11-year offtake agreement with Ørsted to capture and store 2.76 million tonnes of biogenic carbon, and BCG signed a 5-year offtake with CarbonCapture for 40,000 tonnes of DAC credits.

Offtake agreements have benefits for buyers you don't get by negotiating spot purchases directly with suppliers:

01

Support for innovative solutions, no matter the size

By committing to multi-year purchases, buyers help project developers to demonstrate commercial viability sooner in order to accelerate expanded production of innovative carbon removal and storage projects. Unlike other forward purchase mechanisms, there's no minimum investment level or volume commitment required for a buyer to participate.

02

Getting off the "hamster wheel" of annual purchases

Negotiating spot purchases year after year can be an inefficient use of limited resources. In this rapidly evolving space, repeat purchases with the same supplier or set of suppliers may require you to duplicate work — work that only needs to be done once for the duration of a multi-year offtake.

03

Secured inventory

Offtake buyers can lock in inventory over multiple years, even in the context of a diversified portfolio representing different project types. Carbon credit supply can fluctuate — even for any given project from year to year. Unlike spot-purchase carbon credit agreements, an offtake portfolio unlocks long-term possibilities for your portfolio and ensures buyers get the credits they need to fulfill their long-term climate commitments..

04

Stable pricing

Businesses secure impactful carbon removal and storage credit inventory at pre-negotiated set rates—hedging future price volatility from the start and ensure more predictable budget planning as they model out their future spending on climate action.

Three takeaways

01 Carbon credit prices have fallen since 2021, but are expected to increase dramatically over the next 30 years for high-integrity credits as fundamental demand replaces behavioral demand.

02 Prices could reach averages of more than $150 per tonne (on the high side of the models) by 2035 as production costs, integrity standards, and other factors squeeze supply.

03 Offtake agreements provide buyers with a hedge against price and supply concerns by locking in rates and tonnage for many years — replacing annual spot purchasing. This is highly catalytic for projects (and ultimately for climate action), helping them access funding and forward revenues to scale their solutions.

Case study: Bain & Company

Patch Offtake is a multi-year carbon credit pre-purchase agreement that provides companies with a pathway to support and scale a portfolio of novel climate solutions. Carbon credit project developers can translate these agreements into funding and secured revenue for multiple years, supplying them with the resources needed to expand production capacity and deliver meaningful growth in carbon removal and storage.

Bain & Company secured long-term access to consistent supplies of credits from innovative projects including CarbonCure, Mission Zero, Running Tide, and Vesta at locked-in prices.

Patch Offtake provided the ability to diversify their offtake agreement across multiple suppliers in a streamlined process without pre-set minimum investments or volume commitments. This process reduces demands on in-house teams and mitigates risk using a portfolio approach.

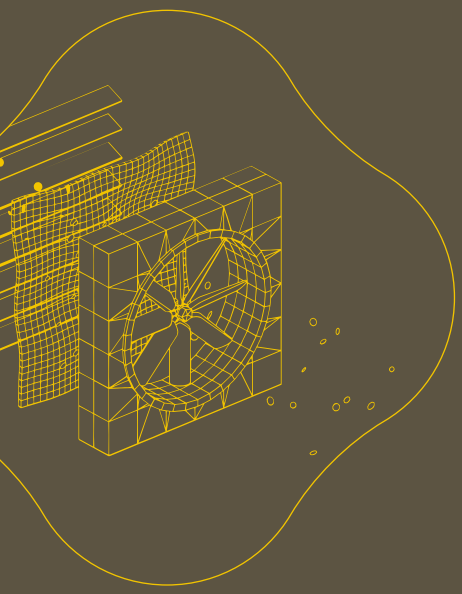
"Patch Offtake comes at the perfect time. By addressing the needs of both project developers and carbon credit buyers, it paves the way to scale the critical solutions the whole world needs right now."

Sam Israelit
Chief Sustainability Officer, Bain & Company

BAIN & COMPANY

Checklist for signing an offtake agreement

- [ ] Set long-term goals for carbon credit access and budgets aligned to your climate commitment
- [ ] Forecast your organization's future emissions and residual emissions
- [ ] Research projects to identify carbon credits of the type and volume that fit your long-term strategy
- [ ] Consult with experts for long-term market insights and trends on the projects you're looking to sign an offtake agreement with
- [ ] Consult directly with projects, or partner with Patch to facilitate your offtake agreement across multiple suppliers
- [ ] Monitor your offtake performance over time
- [ ] Receive and retire your credits per the terms of your offtake



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