

Stripe, Alphabet, Shopify, Meta, and McKinsey launch advance market commitment to buy \$925M of carbon removal by 2030

- Frontier is a nine-year commitment to accelerate the development of permanent carbon removal technologies by guaranteeing future demand.
- Advance market commitments were originally piloted for vaccine development; this is the first time the model is being applied to carbon removal at scale.

SAN FRANCISCO—Stripe, Alphabet, Shopify, Meta, and McKinsey Sustainability are today launching **Frontier**, an advance market commitment (AMC) to accelerate the development of permanent carbon removal technologies. The founding companies plan to commit \$925M over the next nine years to purchase permanent carbon removal from suppliers building promising new solutions.

Frontier aims to send a strong demand signal to researchers, entrepreneurs, and investors that there is a market for carbon removal. The AMC model was successfully piloted a decade ago to accelerate the development of pneumococcal vaccines for low-income countries, saving an estimated 700,000 lives. This is the first time the model is being applied to carbon removal at scale.

Radical emissions reductions will be essential to avoiding the worst effects of climate change. However, recent [reports](#) from the Intergovernmental Panel on Climate Change make clear there is currently no pathway to keeping global temperature increases within 1.5°C without permanently removing gigatons of CO₂ already present in the atmosphere and ocean.

Carbon removal technology has made significant progress, but it is still not on track to reach the required scale. As of 2021, fewer than 10,000 tons of carbon dioxide had been permanently removed from the atmosphere through these kinds of technologies. IPCC models require an average of around 6B tons of annual CO₂ removal by 2050 to hit the 1.5°C target. The Frontier AMC is designed to give the industry confidence to begin building today, and to do so with urgency.

How Frontier works

Frontier conducts due diligence and facilitates carbon removal purchases on behalf of buyers, in two forms:

- For early-stage carbon removal suppliers piloting new technologies, buyers will enter into low-volume prepurchase agreements.
- For growth-stage suppliers scaling their technologies, Frontier will facilitate offtake agreements between individual buyers and suppliers. These agreements promise to purchase future tons of carbon removal if and when they are delivered, enabling

suppliers to secure financing to scale their deployments. When tons of CO₂ are removed, the carbon removal companies get paid, and removal tons are issued back to buyers.

Frontier will identify technologies with the greatest long-term potential and will help them scale through purchases, as well as ongoing advice and support. In practice, this will likely mean paying higher initial prices per ton to accelerate technologies that meet specific criteria, including

- **Permanence:** Stores carbon permanently (>1000 years)
- **Physical footprint:** Takes advantage of carbon sinks less constrained by arable land.
- **Cost:** Has a path to being affordable at scale (<\$100/ton)
- **Capacity:** Has a path to being a meaningful part of the carbon removal solution portfolio (>0.5gt/year)
- **Environmental justice:** Ensures meaningful environmental justice outcomes via a robust process focused on local public engagement

A wholly owned subsidiary of Stripe, Frontier will also be funded by the tens of thousands of businesses who purchase carbon removal via Stripe Climate. This will make Frontier the world's largest coalition of carbon removal purchasers by funding and membership.

Nan Ransohoff, Head of Climate, Stripe: *“With Frontier, we want to send a loud demand signal to entrepreneurs, researchers, and investors that there is a market for permanent carbon removal: build and we will buy.”*

Kate Brandt, Chief Sustainability Officer, Google: *“At Alphabet, we know firsthand from our long-standing history of working to advance new climate solutions that signaling early demand can spur innovation and lower the price for everyone. That’s why we are joining this exciting coalition of climate leaders, who jointly see the promise of new carbon-removal technologies and the power of sending a clear demand signal to the market.”*

Stacy Kauk, Head of Sustainability, Shopify: *“Shopify’s message has been loud and clear since launching our Sustainability Fund back in 2019: Join Us. Climate change can only be solved if we come together, and that’s what we’re doing with this advance market commitment. Our combined demand signal, through Frontier, is exactly what the carbon removal market needs to take the next step.”*

Peter Freed, Head of Energy Strategy, Meta: *“We are committed to reaching net zero emissions across our value chain in 2030 through new partnerships and innovative solutions in emissions reduction and carbon removal. Frontier is an important step to help accelerate the development and adoption of carbon removal technologies for a more sustainable world.”*

Dickon Pinner, Senior Partner and Co-leader of McKinsey Sustainability: *“Reaching net zero emissions is key to building environmental resilience and to realizing a future that delivers sustainable and inclusive growth. Carbon removals have an essential role to play. Our research*

shows that the amount of carbon removals needed by 2025 to achieve the IPCC's 1.5°C pathway will be missed by 80 percent, based on the current pipeline of projects. Frontier will play a catalytic role in enabling the supply of high-quality carbon removal."

Peter Reinhardt, CEO and Co-Founder, Charm Industrial: *"Customers are critical to scaling any business; until recently there have been few for carbon removal. This commitment is a powerful signal that there will be a market for what we're building at Charm. That makes it easier to scale, raise funds and, crucially, bring costs down faster."*

Susan Athey, Economics Professor, Stanford GSB: *"The AMC for pneumococcal vaccines saved almost a million lives by creating certainty about future demand and accelerating development. Frontier can play a similar role: jump-starting investment in carbon removal by giving entrepreneurs and investors confidence in the return on their investments."*

FOUNDERS

Stripe: Stripe announced its plan to start purchasing carbon removal in August 2019, with an initial commitment of \$1M. Today, tens of thousands of Stripe users direct a fraction of their revenue to purchasing carbon removal via Stripe Climate. Together, Stripe and its users have committed \$15M to purchasing from 14 carbon removal startups across North America, Europe, and the Middle East.

Alphabet: Google has a long history of leadership in corporate climate action. In 2007, it was the first major company to achieve carbon neutrality for its operations, and by 2017 it was the first major company to match 100% of its electricity use with renewable energy. Now, Alphabet (Google's parent company) is aiming to achieve net-zero emissions across its operations and value chain by 2030. It will do this by reducing the majority of its emissions (against a 2019 baseline) and also plans to invest in nature-based and technology-based carbon removal solutions to neutralize remaining emissions.

Shopify: Shopify launched its Sustainability Fund in 2019 to accelerate carbon removal solutions. Since establishing the fund, Shopify has committed \$32M to 22 entrepreneurial, tech-driven companies, and is one of the largest corporate purchasers of long-term carbon removal globally, with 39,380 tons purchased to date. Additionally, Shopify is a carbon neutral company and so is our platform. Our data centers, offices, and employee home offices are powered by 100% renewable power. We also source verified carbon offsets to address our travel related emissions, which are 5x our operational footprint. All businesses powered by Shopify can automatically neutralize their shipping emissions with our carbon removal app, and every time a customer places an order using Shop Pay, Shopify funds carbon removal to counteract the impact on the planet at no extra cost.

Meta: Meta recognizes the urgency of climate change and continues to build on more than 10 years of work to minimize its impact on the environment. Since 2020, Meta's global operations

have been supported by 100% renewable energy, reaching net zero greenhouse gas emissions, while its operational emissions have been reduced by 94% from a 2017 baseline. Along with new goals to reach net zero emissions across its value chain and be water positive by 2030, Meta is committed to working with others to help develop new solutions that will reduce greenhouse gas emissions and remove carbon from the atmosphere. This includes supporting forest and grassland restoration as well as engineered carbon removal solutions such as direct air capture.

McKinsey Sustainability: McKinsey Sustainability is the firm's client-service platform with the goal of helping all industry sectors transform to get to net zero by 2050 and to cut carbon emissions by half by 2030. It seeks to be the preeminent impact partner and adviser for the firm's clients, from the board room to the engine room, on sustainability, climate resilience, energy transition, and environmental, social, and governance (ESG). It leverages thought leadership, innovative tools and solutions, top experts, and a vibrant ecosystem of industry associations and knowledge partnerships to lead a wave of innovation and economic growth that safeguards our planet and advances sustainability.