

# BITCOIN'S PATH TO SUSTAINABILITY

## INTRODUCTION

Digital assets and sustainable investing have emerged as two significant megatrends in recent years, with growing institutional interest in both areas. However, Bitcoin, the largest digital asset, faces criticism from climate-focused investors due to its energy-intensive proof-of-work mining process, raising concerns over its environmental impact. In this report, we analyze the Kaiko (previously Vinter\*) Bitcoin Carbon Credit Index, a benchmark that allocates 80% exposure to Bitcoin and 20% to carbon credit futures.

## KEY TAKEAWAYS

- ▶ Hybrid products are emerging to meet growing demand
- ▶ We find that this index mitigates risk while maintaining high returns
- ▶ The Bitcoin Carbon Index achieved a 93% total simulated return in 2024
- ▶ While downside risk remain the severity of drawdowns is lessened

## GROWING DEMAND FOR EXPOSURE TO ESG AND DIGITAL ASSETS

### ESG

Institutional investors are increasingly drawn to companies with strong impact investing practices, seeing them as more appealing choices. In 2022, global sustainable investments reached \$22 trillion, a 50% increase since 2016. ESG assets now make up 47% of managed assets in Canada, 38% in Europe, 34% in Japan, and 13% in the US. Sustainability -focused investments are particularly appealing to long-term investors, such as pension funds and sovereign wealth funds. These investors often adopt sustainable strategies to address systemic risks, like climate change, that cannot be mitigated through diversification alone.

### DIGITAL ASSETS

The January 2024 approval of spot Bitcoin ETFs in the U.S., coupled with expectations for regulatory clarity under the Trump administration following the election, spurred a surge in digital asset adoption. Bitcoin is increasingly seen as “digital gold”, offering both upside and diversification benefits. By year-end, U.S. Bitcoin ETFs managed over \$80 billion in assets, propelling Bitcoin prices above \$100,000, with four ETFs—IBIT, FBTC, ARKB, and BITB—ranking among the top twenty U.S. ETF launches of all time.

Long-term crypto adoption is further bolstered by structural factors such as rising demand for fiscal debasement hedges and the entry of tech-savvy Millennials and Gen Z into financial markets. However, sustainability concerns linger, as Bitcoin's proof-of-work mining consumes an estimated 170 TWh annually, or 0.6%–2.3% of U.S. energy usage, according to the Cambridge Bitcoin Electricity Consumption Index.

### COMMON CONCERNS

Regulatory uncertainty around digital assets may persist, despite expectations, as change can take time. Furthermore, the pace of emission reductions in the US in the wake of the regime change could also shift. The Trump 2.0 administration has made it clear it has positive intent when it comes to crypto but its approach to sustainability leaves a lot to be desired. Only time will tell how the new administration will treat both of these assets classes.

\* In November 2024, Kaiko acquired Vinter. See the official announcement [here](#).

## THE VALUE PROPOSITION

Solutions to mitigate Bitcoin’s carbon footprint are rapidly evolving, including renewable-powered mining operations and tokenized carbon markets. A notable option is the 7RCC Spot Bitcoin Carbon Credits Futures ETF, which integrates Bitcoin exposure with carbon credits. This ETF is benchmarked to the Kaiko Bitcoin Carbon Credit Index built in conjunction with Solactive AG, combining Bitcoin spot prices from seven leading centralized exchanges with the most liquid segments of the carbon credits futures market, including the European Union Allowances (EUA), California Carbon Allowances (CCA), and the Regional Greenhouse Gas Initiative (RGGI).

Below we analyze this hybrid portfolio using the Kaiko Bitcoin Carbon Credit Index, examining its historical performance, risk-return profile, and comparison to market benchmarks. The table below highlights the strengths and weaknesses of a Bitcoin-carbon investment product.

Table 1 - BTC Carbon Credit Portfolio Characteristics

Factor	Strengths	Weaknesses
Volatility	Carbon credits partially offset BTC volatility	BTC remains highly volatile
Diversification	Combines two uncorrelated asset classes	Combines two uncorrelated asset classes
Regulatory/Political Risk	BTC drives growth, carbon credits provide steady gains	Geopolitical tensions and energy policy changes introduce extra risks
Performance Downside	Carbon credits could cushion losses during crypto winters	Dependent on carbon credit market stability
ESG Appeal	Potentially offsets BTC’s carbon footprint	BTC’s reputation for environmental harm could undermine ESG appeal

Source: Kaiko

A solution combining exposure to both Bitcoin and carbon allowances could appeal to investors for four key reasons:

- Sustainable alignment
- Risk-return profile
- Competitive returns
- Diversification benefits

**Adam Mccarthy**, Research Analyst  
adam.mccarthy@kaiko.com

**Dessislava Aubert**, Research Analyst  
dessislava.aubert@kaiko.com

**1. SUSTAINABILITY ALIGNMENT**

The Kaiko Bitcoin Carbon Credit Index tracks carbon allowance futures from key cap-and-trade Emission Trading Systems (ETS). Carbon allowances, issued by governments, cap CO2 emissions and provide a regulated, direct method for emission reduction, distinct from project-based offsets like reforestation. This approach has a proven track record, notably in curbing U.S. acid rain in the 1990s. Over the past decade, the carbon credit market has expanded significantly, particularly in Europe and California, where credits are treated as financial instruments, boosting liquidity and institutional involvement. Both regions use tools like market stability reserves and price controls to manage supply and volatility.

**2. COMPETITIVE RETURNS**

In 2024, the Bitcoin Carbon simulated portfolio achieved a total return of 93%. While it underperformed the broader crypto market—tracked by the Kaiko’s (Previously Vinter) Top 5 Layer 1 Market Cap Index (BTC, ETH, SOL, XRP, and BNB)—it outpaced major traditional assets like Gold, U.S. equities, and a carbon credit-only portfolio.

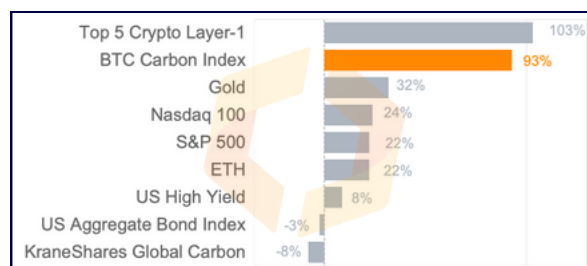
A hybrid portfolio offers the dual benefits of Bitcoin’s upside potential and the stability of decarbonization investments.

While carbon credits may deliver lower returns compared to high-growth crypto assets, their value is expected to rise as regulatory and corporate efforts to reduce emissions intensify. Like Bitcoin, with its fixed supply of 21 million coins, carbon allowances are structurally set for long-term price appreciation due to supply scarcity.

Forecasts suggest EU Emissions Trading System (ETS) allowances could climb to 130–160 EUR per ton of CO2 by 2030, up from 70 EUR today. The California carbon market, the second largest globally, is also projected to experience significant price growth by 2030, driven by stricter supply limits and emissions targets.

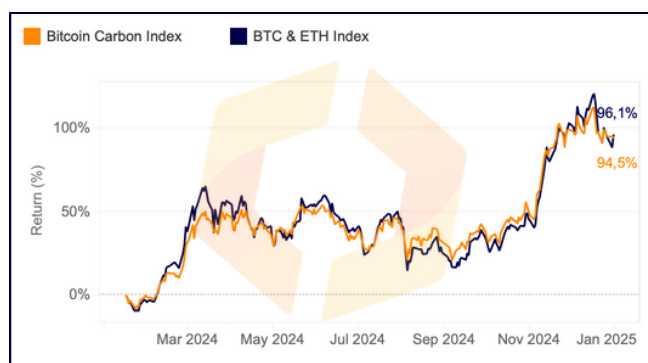
Additionally, a performance comparison with a combined BTC and ETH portfolio could provide further insight, as Ethereum's transition to a more energy-efficient Proof-of-Stake (PoS) consensus mechanism in 2023 reduced its energy consumption by over 99%, leading investors to perceive ETH as a more environmentally friendly asset than Bitcoin. The two portfolios are comparable given that they both blend cryptocurrency with environmentally conscious investments.

Chart 1 - Annual returns



Source: Kaiko Indices and Investing.com. Returns for the period Jan 16, 2024 - Jan 13, 2025.

Chart 2 - Bitcoin carbon performance



Source: Name of the Indices or Kaiko Data Product

ETH lacks widespread recognition as an ESG-compliant asset due to its environmental impact and regulatory uncertainties, making it less suitable for ESG-focused portfolios. Its strong correlation with BTC as well as higher volatility compared to Bitcoin further diminish the risk-return and diversification appeal of a combined BTC-ETH portfolio. Notably, the BTC-ETH portfolio delivered only marginally higher returns in 2024 than the Bitcoin Carbon portfolio, underscoring the benefits of incorporating carbon credits in diversified strategies.

**3. RISK-RETURN BALANCE**

Bitcoin offers high-beta while carbon allowances offer steady growth over the long term, despite some risks related to implementation and demand. Meanwhile the inclusion of carbon credits helps mitigate downside risk during crypto bear markets.

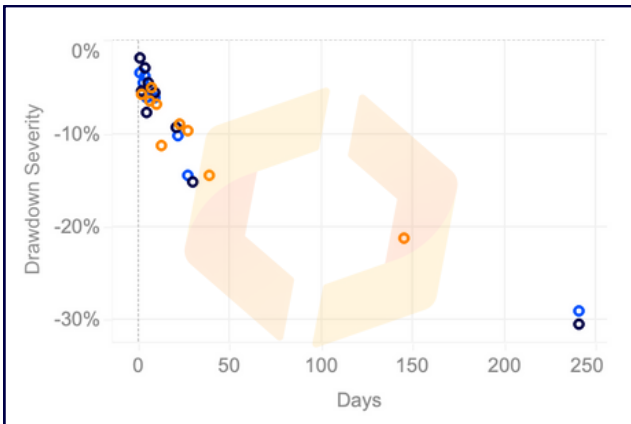
Chart 3 - Rolling volatility: Bitcoin Carbon Index vs. Benchmarks



Source: Kaiko calculations.

Over the past year, the Kaiko Top 5 Layer-1, previously Vinter top 5, investment delivered higher monthly returns, with its best month reaching 45.58%, compared to 33.35% for the Bitcoin Carbon portfolio, indicating stronger performance in bullish market conditions.

Chart 4 - Max drawdowns vs. benchmarks



Source: Kaiko calculations.

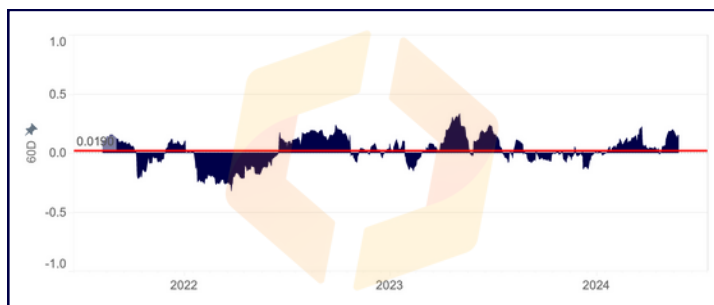
The Kaiko Top 5 Layer-1 investment also had more significant downside. Its worst monthly return of -15.6%, compared to -10.4% for the Bitcoin Carbon, highlighting the latter's relative resilience during market downturns.

All three indices faced prolonged drawdowns in 2024 after BTC reached a record high in March, its first since 2021. The top two and five indices remained below their March peak for over 241 days, with drawdowns of 31% and 29%, respectively. This highlights a key issue with crypto-only indices during sideways markets: the lack of diversification. In contrast, the carbon index experienced a milder 21% drawdown between June and October and recovered much more quickly.

**4. DIVERSIFICATION BENEFITS**

Carbon allowances offer diversification benefits and serve as a potential hedge against portfolio losses during Bitcoin market downturns. The average correlation between Bitcoin and European Union carbon allowance futures, which represent the largest ETS market, is low, averaging just 0.02 over the past two years.

Chart 5 - 60D Correlation



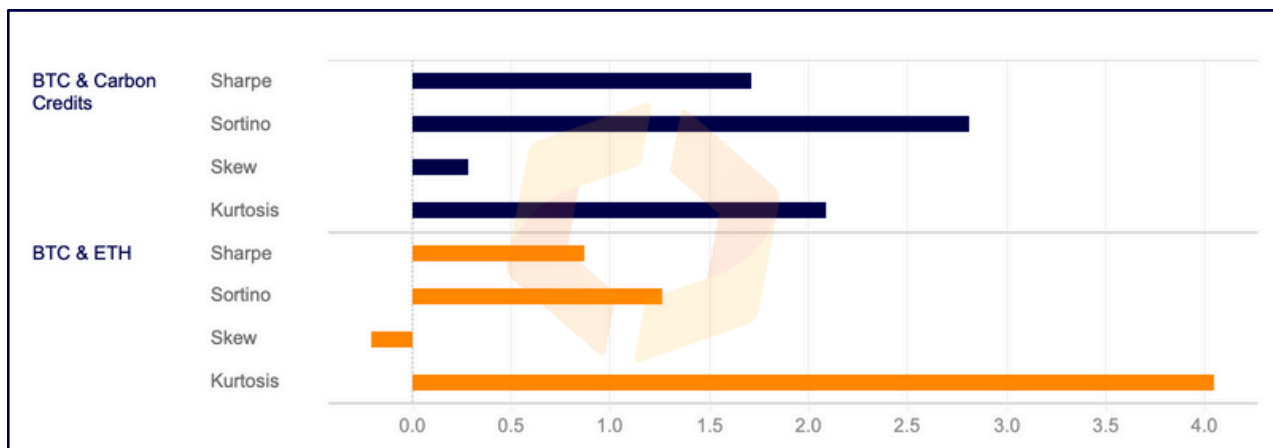
Source: Kaiko and Investing.com for European Union emission Allowances Futures - EUTRZc1.

As well as low correlation, notable risk and performance metrics reinforce the value of diversification via carbon credit futures.

The Kaiko Bitcoin Carbon Credit Index outperforms the combined BTC and ETH Index on a risk-adjusted basis, reflecting better portfolio efficiency. The BTC and ETH Index has kurtosis exceeding 4, signaling frequent extreme outliers, and a negative skew, which increases the likelihood of significant losses.

In contrast, the Bitcoin Carbon Index's kurtosis falls within a normal range (between -2 and 2), suggesting more stable returns.

Chart 6 - Key performance metrics versus BTC & ETH Index

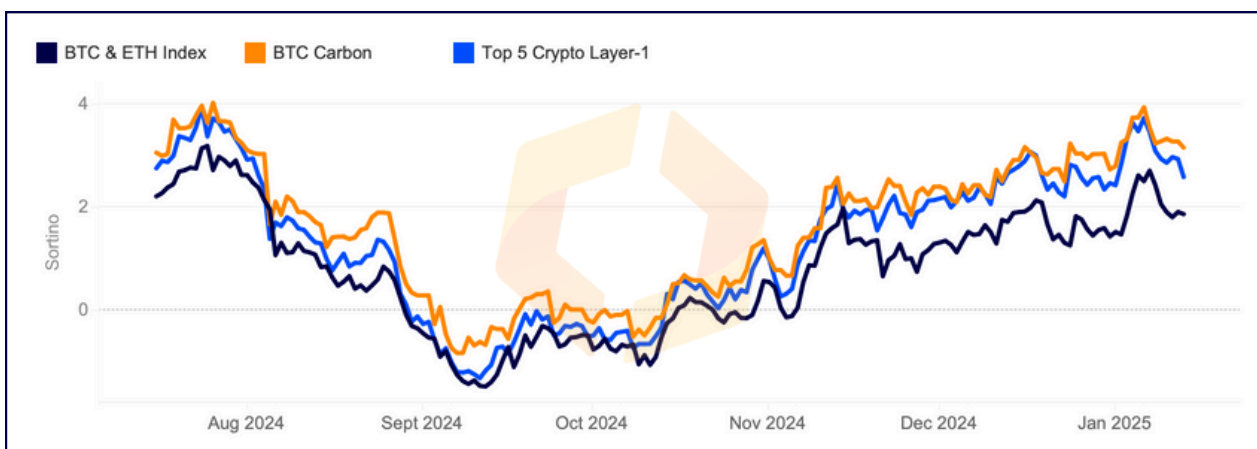


Source: Kaiko calculations.

Crypto markets are known for their large outliers, but volatility often deters investors. Allocating to carbon credit futures alongside Bitcoin mitigates downside risk while maintaining strong returns. This is demonstrated by the rolling Sortino ratio, which measures risk-adjusted performance by focusing on downside volatility, unlike the Sharpe ratio that accounts for both upside and downside risk.

The Bitcoin Carbon Credit Index consistently outperforms benchmarks, achieving an impressive Sortino ratio of 3—an indicator of excellent risk-adjusted returns. While BTC and ETH indices also perform well, the data shows that the Kaiko Bitcoin Carbon Credit Index outperforms in terms of risk-adjusted returns—based on the rolling Sortino ratio below.

Chart 7 - Sortino Ratio of Bitcoin Carbon Index vs. Benchmarks



Source: Kaiko calculations.

**CONCLUSION: TOWARD ESG-INTEGRATED DIGITAL ASSET PORTFOLIOS**

Bitcoin’s high energy consumption has made it a contentious asset for ESG investors. However, innovative strategies such as the one developed by Kaiko’s Bitcoin Carbon Credit Index demonstrate that it’s possible to align Bitcoin exposure with sustainability principles. This hybrid portfolio delivers competitive returns, mitigates volatility, and aligns with the growing demand for sustainable investment strategies.

**DISCLAIMER**

This report is provided for informational purposes only and does not constitute financial, investment, or trading advice. The information contained herein should not be relied upon as a recommendation to make any financial or investment decisions. Past performance is not indicative of future results, and all investments involve risks. Please consult with a qualified financial advisor before making any investment decisions.

**Adam Mccarthy**, Research Analyst  
adam.mccarthy@kaiko.com

**Dessislava Aubert**, Research Analyst  
dessislava.aubert@kaiko.com