Carbon Bridge

A transparent bridge allowing the seamless flow of carbon assets to and from blockchains

Business case

Caspar Chiquet, March 2022

Market context

Voluntary carbon markets have seen tremendous growth in 2021 and has become a USD 1 bn market, up from USD 300 m in 2020. Offset issuances rising 65.5% to 365.8 m offsets in 2021 and retirements up nearly 71% to 161.3 m reflect the increased activity in the market as well (all data from Ecosystem Marketplace). Observers and analysts project further growth for the next years, with net zero pledges from large corporates and initiatives such as the Taskforce for Sacling Voluntary Carbon Markets (TSVCM) led by former Bank of England Governor Mark Carney supporting such projections.

Part of the significant growth was due to the launch of crypto initiatives such as KLIMA and Toucan, which by early 2022 have successfully bridged nearly 20m tons of offsets which are now held by KLIMA. Their initial success has led to an emergence of similar offerings, all aiming to either compete with KLIMA and Toucan, or tap into KLIMA's existing user base and divert some of its assets to tokens competing with the BCT token which was introduced by Toucan.

Shortcomings of current offerings

Toucan (toucan.earth/bridge) is by far the most successful bridge as of today. Toucan has bridged more than 17.5 MT of VCUs in less than 6 months since its inception. That number represents a significant share of VCUs in circulation in the secondary market. Demand was mostly driven by the KLIMA DAO (klimadao.finance) and its treasury activities, which absorbed the majority of BCT converted from retired VCUs. In recent weeks however, BCT prices have slipped markedly below price levels which can sustain additional retirement of VCUs. On the contrary, BCTs now trade significantly below their equivalent VCUs in off-chain markets, but the nature of the Toucan bridge, which is one-way by design, prevents the arbitrage to reverse and traps excess BCT volume on chain, keeping prices depressed in absence of aggressive further buying by KLIMA DAO.

The second shortcoming of the Toucan bridge is its misalignment with the major standardized

contracts that serve as references for off-chain markets and a liquidity backstop for traders. Toucan may have kept the spec of the BCT pool as open as possible on purpose to allow KLIMA DAO to meet its goal of serving as a "black hole" for carbon. But now that the low-hanging fruit are all gone and absorbed by KLIMA DAO's treasury, the misalignement with major specs such as GEO or NGEO prevents benchmarking BCT against those off-chain products, which in turn could support the price for BCT in absence of KLIMA DAO treasury activity.

Other offerings are designed without these two major shortcomings, such as the AirCarbon platform, which in essence is also a bridge enabling the tokenization of VCUs. AirCarbon operates a custodian account for holders of VCUs and issues corresponding tokens on its trading platform. The process is reversible, allowing token holders to redeem their tokens for corresponding VCUs. The token specs on AirCarbon are also well aligned with major off-chain specs such as GEO and NGO and allow simple benchmarking, leading to a very narrow spread, if at all, between AirCarbon's tokens and those major benchmarks. AirCarbon's major shortcoming however lies in its nature of being a completely closed ecosystem without any links to a wider crypto ecosystem whatsoever. That means token holders on AirCarbon are limited to trading on the platform, without access to any Defi solutions such as collateralization or yield generation. That means also that AirCarbon is unable to access any potential liquidity of such existing crypto ecosystems.

Another emerging bridge is Moss, which has initiated a successful collaboration with KLIMA DAO, in part also due to the increasingly strained relationship between Toucan and the DAO. Moss is bridging VCUs from its own portfolio of projects and issues an opaque token without much transparency around the exact composition of the underlying portfolio. It is also not clear if and how Moss would make its token accessible to other VCU project owners. The token that Moss issues is loosely defined as a nature-based carbon token, but does not match the specifications of the widely traded NGO benchmark contract. It is also not clear if holders of a Moss token would be able to redeem it against a VCU. Despite these shortcomings, the KLIMA DAO treasury has redirected some of its liquidity pools to include the Moss token, as well as permanently holding some Moss tokens in its treasury.

None of the existing and emerging bridges allow a seamless, bidirectional arbitrage between off-chain and on-chain markets. Such a solution could bring major benefits to off-chain holders of VCUs who would be able to more easily generate yields on their holdings as well as access to additional demand. At the same time, crypto investors would be able to trade the same product specs that attract the most liquidity in traditional carbon markets, improving transparency and price discovery and opening up bidirectional arbitrage, increasing the efficiency of voluntary carbon markets as a whole.

	Toucan	Moss	AirCarbon
2-way bridge	X	?	✓
off-chain accessibility	✓	X	✓
on-chain accessibility	✓	✓	X
product alignment	X	X	✓

Proposed two-way carbon bridge

Our carbon bridge is designed to address all the shortcomings of current offerings and offer a seamless pathway to tokenize off-chain VCUs into standardized specifications that align with the major products prevalent in the market. The bridge operates bidirectionally, allowing token holders to redeem their tokens against a physical VCU delivered to the Verra account of their choice. The bridge is open to all VCUs and token holders and tokens will be fully portable and integrated in the larger ecosystem of the respective blockchain(s) they are operating on.

Custodian VCU account

VCUs that are brought on chain via our bridge will be deposited into and held in a custodian Verra account operated by the bridge. This is currently the only way to enabe a two-way bridge as the retirement mechanism that Toucan utilizes for tokenization is irreversible. Unless Verra and Gold Standard evolve to natively support custodian accounts or escrow funcionality, the only solution is for the bridge operator to directly manage deposited VCUs in escrow. The bridge will hold 100% of deposited VCUs in escrow at all times and will not securitize or leverage deposits in any form. Escrow holdings will be regularly audited by a qualified 3rd party and the reports made publicliy available. The legal entity operating the bridge and the custodian account will likely be registered in Switzerland, either as a limited liability corporation (Aktiengesellschaft, AG) or as a foundation (Stiftung).

Account opening

Prospective users of the bridge will need to open an account with the bridge. The bridge will perform KYC in line with regulatory requirements (if any), as well as confirm that prospective users have control over an operational Verra account. As part of the setup, bridge users will have to perform a Satoshi-Test where the bridge will instruct the user to transfer a random, small number of VCUs to the bridge to demonstrate ownership over the linked Verra account. The transferred VCUs will be transferred back to the user, or the user can opt to be reimbursed

in cryptocurrency as a seed fund for covering gas fees of future transactions. Successful KYC and passing the Satoshi-Test will conclude the account opening and the user will be able to initiate transfers across the bridge in both directions.

Minting tokens

Account holders initiate the bridging process by transferring qualified VCUs into the Verra account operated by the bridge. Upon receival of the VCUs in the bridge account, the account holder can confirm the eligible standardized carbon token (one VCU may be eligible for mulitiple standardized tokens) and initiate the minting process by authorizing the transaction and corresponding gas fee. The bridge will mint a corresponding number of standardized carbon tokens and deposit them into the wallet of the account holder. The account holder is then free to manipulate the tokens directly from the wallet and interact with the ecosystem for standardized carbon tokens on chain.

Redeeming tokens

Redemption of tokens is initiated by an account holder with sufficient tokens on the bridge interface. Only integer numbers (no decimals) can be bridged back to VCUs, as VCUs cannot be held in decimals. The account holder confirms the amount and corresponding attributes of VCUs to bridge into, authorizes the gas fee and initiates the bridging process. The bridge will deposit a corresponding amount of VCUs meeting all attribute requirements of the deposited standardized carbon token into the Verra account of the account holder. It is important to note that there is no guarantee for account holders to receive the same originally deposited VCUs back - the bridge will algoritmically allocate any VCUs meeting the standard specifications from its pool of VCUs in custody, while minimizing the number of different lots per transaction. On successful receipt of the VCUs, the bridge will burn the corresponding standardized tokens to conclude the transaction. In case of an unsuccessful bridging event, the tokens will be returned to the account holders wallet, less the bridging fee.

Liquidity pools and trading

WIth the bridge infrastructure in place, liquidity pools can be set up for the most important trading pairs, including between the standardized carbon token and a stablecoin of choice. Providers of liquidity pairs will earn fees from trades, and LP holders can be further incentivized via staking or other mechanics. The team behind the bridge will seed initial liquidity pools together with partners, but commercial operations on chain will be kept separate from the bridge, with the bridge entity only collecting fees for bridging operations intended to cover operational costs of the bridge.

Liqduidity is expected to concentrate due to the standardized nature of tokens and their potential to be benchmarked against standardized contracts trading off-chain on exchanges. Arbitrage opportunities will arise bidirectionally and can be exploited by traders providing liquidity on either side of the bridge.

On-chain applications for tokens

The main on-chain application for standardized tokens will be for retirement and carbon neutrality. The team will create an inititial version of a carbon footprint calculator and the bridge will provide an interface for retiring tokens for the purpose of carbon neutrality. Retiring tokens will lead to the bridge retiring a corresponding amount of VCUs in its Verra account, with a reference to the retirement transaction, and finally burning the tokens on chain to complete the retirement. The team will work to integrate standardized carbon tokens into existing on-chain solutions for collateralization, staking and other applications, and actively develop further use cases for the standardized tokens complementing existing offerings. Specifically, the team will work to replicate standardized forward and option contracts natively on chain to support the establishement of a forward market for tokens.

The team

The team behind the carbon bridge combines decades of hands-on experience in both carbon markets as well as crypto applications. The unique insights into underlying market drivers of carbon offsets, as well as a deep understanding of the challenges and needs of off-chain stakeholders complement the development capabilities and proven track record to launch innovative blockchain applications.

WANG Ziyuan

Ziyuan has been working in climate change and carbon trading since 2005 when the Kyoto Protocol became operational. As one of the pioneers of the industry, she managed the project issuing the first CERs ever in China and since then has kept at the forefront of environmental markets serving different roles with leading players in the field.

For more than a decade, Ziyuan had been with Shell's environment product trading team as portfolio manager to manage the company's global carbon offset portfolio. She has developed a comprehensive and in-depth understanding of the global carbon markets from her rich experience on the front lines.

Ziyuan holds an M.Sc. in Environmental Management for Business from Cranfield University in the U.K.

Jing LIU

Jing LIU is a senior software professional with over 20 years of technical and commercial experience in the IT industry. Jing has worked as a tech lead of a global enterprise and as CEO of several local Chinese companies. His recent career focus is on crypto quant trading. He graduated from NUS with a MS degree in software modeling.

WJ ZHANG

WJ Zhang is a topnotch full-stack engineer with extensive achievements in both software and hardware development. Previously, WJ had led the data infrastructure team at the largest video streaming company in China and later served as the CTO for a few early Chinese blockchain startups. He holds a BS degree in Information Technology from BNU.

Caspar Chiquet

Caspar has 15 years of experience in environmental markets. He started his career at South Pole, the leading global offset project developer, where he built up the China business. He continued in various roles at South Pole, including contributing to South Pole's foray into digital offerings and ecommerce, including South Pole's carbon footprint calculator for the Bloomberg terminal, South Pole's online platform for retail carbon offsets as well as digital metering solutions for offset projects.

He joined oil major bp in 2017, trading compliance carbon offsets and allowances in China, as well as developing a pipeline of carbon offset projects in various markets.

Most recently, he works at Glencore where he is responsible for origination of carbon offset projects worldwide.