LEDGER
ledgerjournal.org

ISSN 2379-5980 (online)
associated article DOI 10.5195/LEDGER.2023.294

Tokenized Carbon Credits

Derek Sorensen*†

Reviewers: Reviewer A, Reviewer B

Abstract. The final version of the paper "Tokenized Carbon Credits" can be found in Ledger Vol. 8 (2023) 76-91, DOI 10.5195/LEDGER.2023.294. There were two reviewers involved in the review process, neither of whom has requested to waive their anonymity at present, and are thus listed as Reviewers A and B. After initial review by Reviewers A and B, the submission was returned to the authors with feedback for revision (1A). The author resubmitted their work and responded to reviewer comments (1B), after which it was returned to the reviewers. Reviewer B offered further feedback (2A) which the author addressed with further revisions, thus ending the peer review process. Author responses have been bulleted for reader clarity.

1A. Review

Reviewer A

Does this paper represent a useful reference or tool for academic or industry researchers of cryptocurrency and/or blockchain scholarship?

Yes, useful to most or all

Please briefly explain why you think the paper would or would not be useful to researchers.

This manuscript provides an important contribution by addressing the challenges and opportunities of using blockchain and tokens to create an inter-operable and publicly accessible platform for tracking and trading carbon credits. It does an excellent job of describing the various existing blockchain and related project relating to carbon credits, and explains how these various projects operate and differ.

Is the submission's coverage of the topic comprehensive and up to date?

Yes

* Derek Sorensen (ds885@cam.ac.uk) is a PhD candidate at the University of Cambridge and a member of the Cambridge Centre for Carbon Credits (4C).

† bc1qjajqs8zntgn5fy38wap8untf8dtz0z8cv8v6pj

If only a few important references are missing, please indicate which references are missing. If the coverage is lacking in a broader way, please explain.

No omissions noted.

Please assess the article's level of academic rigor.

Excellent (terms are well defined, important concepts are explained succinctly and clearly, coverage is detailed and up to date)

Please assess the article's quality of presentation.

Good (not excellent but a long way from poor)

How does the quality of this review compare to other reviews in this field?

This is one of the best reviews in the field.

Please provide your free-form review for the author in this section.

This is an excellent contribution to the literature. My only suggestion is provide a few more details on some of the differences between carbon credits, a topic which is otherwise properly emphasized in the manuscript. For example, one difference that might be mentioned more specifically is the duration of the carbon credits. It is my understanding that carbon credits generated by direct air capture are validated for 1000 years (or more) of storage. In contrast, credits from soil sequestration based on different farming practices can only practically be guaranteed for 10 years, as any longer restrictions on land use are no credible or feasible. Another difference between credits that might be explored a bit more is whether there is a meaningful difference between carbon offset credits and carbon removal credits. Both involve reducing carbon levels by a set amount (eg 1 ton), but an offset credit just prevent the addition of more carbon to the atmosphere, whereas the carbon removal credit involves reducing the carbon already in the atmosphere. Given the policy significance being given to carbon removal, do these two types of credits need to be tracked and counted differently? Would be helpful if author addressed this additional complexity.

Reviewer B

Does this paper represent a novel contribution to cryptocurrency or blockchain scholarship?

Yes, incremental contribution(s)

ISSN 2379-5980 (online)
associated article DOI
10.5195/LEDGER.2023.294

Please briefly explain why you think the paper makes or does not make a novel contribution.

The paper provides a comprehensive technical analysis of major tokenized carbon credit projects, examining the mechanisms for tokenizing credits, token standards, approaches to fungibility and liquidity, and applications built on top of carbon credits. Technical detail and focus on interoperability issues is a novel contribution compared to previous work.

Is the research framed within its scholarly context and does the paper cite appropriate prior works?

Yes

Please assess the article's level of academic rigor.

Good (not excellent but a long way from poor)

Please assess the article's quality of presentation.

Good (not excellent but a long way from poor)

How does the quality of this paper compare to other papers in this field?

The paper ranks highly but it may not be among the most authoritative references in the field.

Please provide your free-form review for the author in this section.

Introduction
-> Explain incentives for different stakeholders (projects, traders, regulators etc.) to improve interoperability.
-> Can cover more prior work on DeFi composability, tokenized assets

Tokenized Carbon Credits
-> Include statistics on trading volumes, user bases for each project
-> Analyze 2 additional major tokenized carbon credit projects

Trading Carbon Credits
-> Quantitatively analyze liquidity on different DEXs for the tokens
-> Insights on regulations that impact cross-chain interoperability
-> Also, can provide details regarding feasibility of different bridge designs for interoperability

Programmable Carbon
-> Expand this section with more examples of DeFi composability using carbon credits

ISSN 2379-5980 (online)
associated article DOI
10.5195/LEDGER.2023.294

1B. Author Response

Reviewer A

My only suggestion is provide a few more details on some of the differences between carbon credits, a topic which is otherwise properly emphasized in the manuscript. ... For example, one difference that might be mentioned more specifically is the duration of the carbon credits. ... Another difference between credits that might be explored a bit more is whether there is a meaningful difference between carbon offset credits and carbon removal credits.

- This was useful feedback. I expanded Section 3, *Tokenized Carbon Credits*, to include more details on each of the carbon credit projects, including details on what kinds of carbon credits are tokenized. There is not much clarity in the relevant documentation on duration of captured carbon and how that plays a role, but some projects were concerned with insuring their carbon credits and diversifying risk, something I emphasized. Also, each project mentioned values 1 tonne of carbon per token, which I mentioned. In order to emphasize the technical differences about which the paper is concerned, I added a table to visually compare the surveyed carbon credits.

Reviewer B

Introduction
-> Explain incentives for different stakeholders (projects, traders, regulators etc.) to improve interoperability.

- The introductory paragraph used to only claim that a lack of interoperability was "judged to be undesirable," along with some citations. I made this statement more explicit, now saying what is described in the literature, that a lack of interoperability leads to "fragmented, inefficient, and volatile markets." Section 5 (*Programmable Carbon*) expounds further as to why efficient and stable markets are desirable in the eyes of the projects and traders.

-> Can cover more prior work on DeFi composability, tokenized assets

- I added a discussion about DeFi composability to the related work, as well as in Section 5 (*Programmable Carbon*).

Tokenized Carbon Credits
-> Include statistics on trading volumes, user bases for each project

- Statistics and trading volumes are fairly hard to come by, as trading data is not readily available. I also did not believe that this fit into the narrative of the paper, as the paper

ISSN 2379-5980 (online)
associated article DOI
10.5195/LEDGER.2023.294

tries to highlight technical hurdles to interoperability. Instead, I rewrote Section 4 (*Trading Carbon Credits*) to tell a more accurate story of interoperability.

-> Analyze 2 additional major tokenized carbon credit projects

- Is there a reason for the number 2? The projects covered in the paper are the only major ones of which I'm aware. There are several projects which are adjacent to tokenizing carbon credits, some of which I mention already (I have also added some more of these). I'm very happy to add more tokenized carbon credits if the reviewer can point me in that direction.

Trading Carbon Credits
-> Quantitatively analyze liquidity on different DEXs for the tokens

- Similar to before, I didn't think that quantifying liquidity on various DEXes fit in with the ethos of this paper, so I decided to not make this change.

-> Insights on regulations that impact cross-chain interoperability
-> Also, can provide details regarding feasibility of different bridge designs for interoperability

- Cross-chain bridge technology is highly relevant, and the reviewer was right to point out that it was lacking. I added a paragraph to the *Trading Carbon Credits* section to discuss cross-chain bridges and indicate what they might mean for interoperability.

Programmable Carbon
-> Expand this section with more examples of DeFi composability using carbon credits

- I added a *Relating to DeFi* subsection to the manuscript. I hope these changes are sufficient, please see the updated manuscript from here and let me know if there any additional changes required.

2A. Second Round Review

Reviewer A

Did you review an earlier version of this submission? (If "no," please contact the editor.)

Yes

Has the submission been sufficiently revised to address your previous concerns?

Yes

ISSN 2379-5980 (online)
associated article DOI
10.5195/LEDGER.2023.294

Do you have any new concerns specific to this revision?

No

Reviewer B

Did you review an earlier version of this submission? (If "no," please contact the editor.)

Yes

Has the submission been sufficiently revised to address your previous concerns?

Yes

Do you have any new concerns specific to this revision?

Yes

If you answered "yes" to the previous question, please provide more detailed feedback here.

- In Section 3.5 on Nori, the description of the NORI token and its economics could be clarified a bit more. It's described both as a utility token and a cryptocurrency medium of exchange. Explaining this dual purpose more precisely would help.

- Section 4 could be restructured to first cover all the applications, then have the key takeaways paragraph. Right now the takeaways interrupt the flow a bit.

- Some of the citations are formatted inconsistently. For example, compare #40 and #46. Standardizing all the citations would polish things up.

ISSN 2379-5980 (online)
associated article DOI
10.5195/LEDGER.2023.294