

[0010] A public, permissionless blockchain is an append-only data structure maintained by a network of nodes that do not fully trust each other. A permissioned blockchain is a type of blockchain where access to the network of nodes is controlled in some manner, e.g., by a central authority and/or other nodes of the network. All nodes in a blockchain network agree on an ordered set of blocks, and each block may contain one or more transactions. Thus, a blockchain may be viewed as a log of ordered transactions. One particular type of blockchain (e.g., Bitcoin) stores coins as system states shared by all nodes of the network. Bitcoin-based nodes implement a simple replicated state machine model that moves coins from one node address to another node address, where each node may include many addresses. Furthermore, public blockchains may include full nodes, where a full node may include an entire transactional history (e.g., a log of transactions), and a node may not include the entire transactional history. For example, Bitcoin includes thousands of full nodes in all of the nodes that are connected to Bitcoin.

[0011] With the advent of decentralized blockchains came decentralized finance, or "DeFi." DeFi is an umbrella term for de-centralized permissionless financial infrastructure, wherein a variety of cryptocurrency-based financial applications operate. What makes these applications decentralized is that they are not managed by a central institution, but instead, the rules of these applications are written in code, and the code is open to the public for anyone to audit. These rules written in code are known as "smart contracts," which are programs running on a blockchain that execute automatically when certain conditions are met. DeFi applications are built using smart contracts. DeFi applications can be viewed as a cluster of second layer decentralized applications (e.g., DApps) running on top of a blockchain.

[0012] It is with respect to these and other general considerations that the aspects disclosed herein have been made. Also, although relatively specific problems may be discussed, it should be understood that the examples should not be limited to solving the specific problems identified in the background or elsewhere in the disclosure.

SUMMARY

[0012a] According to a first aspect of the present invention, there is provided a system including: at least one processor; and memory coupled to the at least one processor, the memory including computer executable instructions that, when executed by the at least one processor, perform the steps including: receiving at least one contract term, wherein the contract term defines an algorithm for calculating a carbon intensity (CI) score; receiving input data associated with at least one participant in a supply chain; recording the at least one state on the blockchain; based on the input data associated with the at least one participant and the algorithm defined by the at least one smart contract term, determining a CI score; recording the CI score on the blockchain so that the recorded CI score is immutable.

[0012b] According to a second aspect of the present invention, there is provided a system including: at least one processor; and memory coupled to the at least one processor, the memory including computer executable instructions that, when executed by the at least one processor, perform the steps including: receiving at least one contract term; receiving input data associated with at least one participant in a supply chain; based on the input data associated with the at least one participant and the at least one contract term, determining a carbon intensity (CI) score; recording the CI score so that the recorded CI score is immutable; applying at least one machine-learning model to the CI score; and generating at least one suggestion for decreasing the CI score, wherein the at least one suggestion is a suggestion to the at least one participant for decreasing the CI score in a future iteration of the supply chain.

[0012c] According to a third aspect of the present invention, there is provided a system including: at least one processor; and memory coupled to the at least one processor, the memory including computer executable instructions that, when executed by the at least one processor, perform the steps including: receiving at least one contract term; receiving input data associated with at least one participant in a supply chain; based on the input data associated with the at least one participant and the at least one contract term, determining a carbon intensity (CI) score; recording the CI score so that the recorded CI score is immutable; applying at least one machine-learning model to the CI score; and generating at least one suggestion for decreasing the CI score, wherein the at least one suggestion is a suggestion to a second participant in the supply chain for decreasing the CI score, wherein the second participant is subsequent to the at least one participant in the supply chain.

[0012d] According to a fourth aspect of the present invention, there is provided a system including: at least one processor; and memory coupled to the at least one processor, the memory including computer executable instructions that, when executed by the at least one processor, perform the steps including: receiving at least one contract term; receiving input data associated with at least one participant in a supply chain; based on the input data associated with the at least one participant and the at least one contract term, determining a carbon intensity (CI) score; recording the CI score so that the recorded CI score is immutable; applying at least one machine-learning model to the CI score; and generating at least one suggestion for decreasing the CI score, wherein the at least one suggestion is a suggestion to select at least one subsequent processing facility in the supply chain based on the CI score exceeding a score threshold.

[0012e] According to a fifth aspect of the present invention, there is provided a method for generating intelligent suggestions for lowering a CI score, including: receiving, by a processor, at least one contract term, wherein the contract term defines an algorithm for calculating a carbon intensity (CI) score; receiving, by the processor, input data associated with a stage in a supply chain; based on the input and the algorithm defined by the at least one contract term, calculating, by the processor, a CI score; assigning, by the processor, the intermediate CI score to the stage; storing, by the processor, the CI score so that the stored CI score is immutable.

[0012f] According to a sixth aspect of the present invention, there is provided a method including: receiving, by a processor, input data associated with a stage in a supply chain; based on the input, calculating, by the processor, a carbon intensity (CI) score; assigning, by the processor, the CI score to the stage; storing, by the processor, the CI score so that the stored CI score is immutable; comparing, by the processor, the CI score to a threshold CI score; and based on the comparison of the CI score to the threshold CI score, generating, by the processor, at least one intelligent suggestion associated with lowering the CI score, wherein the at least one intelligent suggestion is a suggestion to the at least one participant for decreasing the intermediate CI score in a future iteration of the supply chain.

[0012g] According to a seventh aspect of the present invention, there is provided a method including: receiving, by a processor, input data associated with a stage in a supply chain; based on the input, calculating, by the processor, a carbon intensity (CI) score; assigning, by the processor, the CI score to the stage; storing, by the processor, the CI score so that the stored CI score is immutable; comparing, by the processor, the CI score to a threshold CI score; and based on the comparison of the CI score to the threshold CI score, generating, by the processor, at least one intelligent suggestion associated with lowering the CI score, wherein the at least one suggestion is a suggestion to a second participant following the at least one participant in the supply chain, wherein the second participant has not yet received the at least one product in the supply chain.

CLAIMS

1. A system comprising:
at least one processor; and
memory coupled to the at least one processor, the memory comprising computer executable instructions that, when executed by the at least one processor, perform the steps comprising:
 - receiving at least one contract term,, wherein the contract term defines an algorithm for calculating a carbon intensity (CI) score;
 - receiving input data associated with at least one participant in a supply chain;
 - recording the at least one state on the blockchain;
 - based on the input data associated with the at least one participant and the algorithm defined by the at least one smart contract term, determining a CI score;
 - recording the CI score on the blockchain so that the recorded CI score is immutable.
2. A system comprising:
at least one processor; and
memory coupled to the at least one processor, the memory comprising computer executable instructions that, when executed by the at least one processor, perform the steps comprising:
 - receiving at least one contract term;
 - receiving input data associated with at least one participant in a supply chain;
 - based on the input data associated with the at least one participant and the at least one contract term, determining a carbon intensity (CI) score;
 - recording the CI score so that the recorded CI score is immutable;
 - applying at least one machine-learning model to the CI score; and
 - generating at least one suggestion for decreasing the CI score, wherein the at least one suggestion is a suggestion to the at least one participant for decreasing the CI score in a future iteration of the supply chain.
3. A system comprising:
at least one processor; and
memory coupled to the at least one processor, the memory comprising computer executable instructions that, when executed by the at least one processor, perform the steps comprising:
 - receiving at least one contract term;
 - receiving input data associated with at least one participant in a supply chain;
 - based on the input data associated with the at least one participant and the at least one contract term, determining a carbon intensity (CI) score;
 - recording the CI score so that the recorded CI score is immutable;
 - applying at least one machine-learning model to the CI score; and

generating at least one suggestion for decreasing the CI score, wherein the at least one suggestion is a suggestion to a second participant in the supply chain for decreasing the CI score, wherein the second participant is subsequent to the at least one participant in the supply chain.

4. A system comprising:
at least one processor; and
memory coupled to the at least one processor, the memory comprising computer executable instructions that, when executed by the at least one processor, perform the steps comprising:
receiving at least one contract term;
receiving input data associated with at least one participant in a supply chain;
based on the input data associated with the at least one participant and the at least one contract term, determining a carbon intensity (CI) score;
recording the CI score so that the recorded CI score is immutable;
applying at least one machine-learning model to the CI score; and
generating at least one suggestion for decreasing the CI score, wherein the at least one suggestion is a suggestion to select at least one subsequent processing facility in the supply chain based on the CI score exceeding a score threshold.
5. The system of any one of claims 1-4, wherein the input data comprises at least one agricultural practice.
6. The system of any one of claims 1-4, wherein the input data comprises at least one chemical production practice.
7. The system of any one of claims 1-4, wherein the input data comprises at least one of: a location, a process, a financial constraint, a regenerative agricultural practice, a green energy input, a measurement of water usage, and a measurement of at least one energy source.
8. The system of any one of claims 1-4, wherein the CI score is further determined by referencing at least one regulatory institution's CI score calculation.
9. The system of any one of claims 1-4, the steps further comprising:
generating a CI token based on the CI score; and
storing the CI token so that the stored CI token is immutable.
10. The system of claim 7, the steps further comprising:
applying the CI token to offset at least one instance of carbon emissions; and
based on the application of the CI token, burning the CI token.

11. The system of claim 4, wherein the at least one subsequent processing facility is a renewable energy powered processing facility, if the at least one CI score exceeds the CI score threshold.
12. The system of claim 4, wherein the at least one subsequent processing facility is a fossil fuel powered processing facility, if the at least one CI score does not exceed the CI score threshold.
13. The system of claim 2, wherein the at least one suggestion comprises at least one suggestion associated with: a shipping method, a fuel selection, a fertilizer brand, and an application rate of pesticides.
14. The system of claim 2, wherein the at least one machine-learning model utilizes at least one of the following algorithms: linear regression, logistic regression, linear discriminant analysis, classification and regression trees, naive Bayes, k-Nearest neighbors, learning vector quantization, neural networks, support vector machines (SVM), bagging and random forest, and AdaBoost.
15. A method for generating intelligent suggestions for lowering a CI score, comprising:
 - receiving, by a processor, at least one contract term, wherein the contract term defines an algorithm for calculating a carbon intensity (CI) score;
 - receiving, by the processor, input data associated with a stage in a supply chain;
 - based on the input and the algorithm defined by the at least one contract term, calculating, by the processor, a CI score;
 - assigning, by the processor, the intermediate CI score to the stage;
 - storing, by the processor, the CI score so that the stored CI score is immutable.
16. A method comprising:
 - receiving, by a processor, input data associated with a stage in a supply chain;
 - based on the input, calculating, by the processor, a carbon intensity (CI) score;
 - assigning, by the processor, the CI score to the stage;
 - storing, by the processor, the CI score so that the stored CI score is immutable;
 - comparing, by the processor, the CI score to a threshold CI score; and
 - based on the comparison of the CI score to the threshold CI score, generating, by the processor, at least one intelligent suggestion associated with lowering the CI score, wherein the at least one intelligent suggestion is a suggestion to the at least one participant for decreasing the intermediate CI score in a future iteration of the supply chain.
17. A method comprising:
 - receiving, by a processor, input data associated with a stage in a supply chain;
 - based on the input, calculating, by the processor, a carbon intensity (CI) score;

assigning, by the processor, the CI score to the stage;

storing, by the processor, the CI score so that the stored CI score is immutable;

comparing, by the processor, the CI score to a threshold CI score; and

based on the comparison of the CI score to the threshold CI score, generating, by the processor, at least one intelligent suggestion associated with lowering the CI score, wherein the at least one suggestion is a suggestion to a second participant following the at least one participant in the supply chain, wherein the second participant has not yet received the at least one product in the supply chain.

18. The method of claim 15, wherein the input data comprises data on a participant in the supply chain and a product being processed in the supply chain