Development Engineering Project

Application of Blockchain Technology In Incentivizing Rural Waste Management

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Introduction

Rural areas in developing countries in India have been constantly plagued by issues of poor sanitation and energy shortages. The main issue is the decentralized nature of waste generation and energy consumption and centralized nature of waste treatment leading to farmer burning crop stocks , lumber and other agricultural waste. Stubble burning in parts of Punjab and other northern parts of India is an issue of concern for the present government. While the large population lacks access to waste management services the untreated waste permanently damages the ecosystem. The agricultural waste like crop straw and animal residue can be used to produce clean energy and agricultural by product like briquettes, fertilizer, and animal feedstock . Considering the decentralized nature of waste generation and centralized nature of waste treatment there is a need for a digital solution where farmers (or other participants) and enterprises can be incentivized so that they work together . The main aim of the project is to build a decentralized application prototype where the farmers(or other participants) and enterprises can trade the waste , energy and other by - products using a digital coupon or a cryptocurrency which includes a framework for efficient management and recording of waste supply chain . Each transaction is recorded on a universal ledger instead of a centralized database through smart contracts on an ethereum network thus making it secure and transparent .

Work Progress

- Build a smart contract written in solidity which can be accessed through a blockchain wallet in which the user can register his wallet address , create assets and send asset transfer requests , accept requests and check his/her balance.
- Created and deployed my decentralized application on the Simba chain network using the smart contract. This network can be accessed through web api or python library pylibsimba. We can perform transactions on this network and also view the transactions which can be used for tracking the whole waste supply chain making the participants accountable.

- Build a django based web application which the users can use to interact with the blockchain network. There is a centralized database to store the basic information about the user.

  Functionalities -

  - Register - Users can register themselves on the portal . Each user is assigned a unique blockchain wallet and associated address which can be used to interact with the network.
  - Create Waste - Users can be provided with special containers or bags along with associated unique identifiers(uuid) . The user can register the same on the portal when the user is ready to dispose off the waste .For simplicity two types of waste is considered one which can be converted to energy and other to fertilizer.
  - Transfer waste - By default the ownership of the asset ie. The waste is attributed to the one who created it. However it can be transferred in exchange of digital coins.
  - Track or view history - Users can view the ownership and track history of the asset (Waste) .

Challenges and Future Work

- Transactions on the Blockchain network take time before they get deployed however for client side application we need better performance . We need to add asynchronous transactions to avoid delay on the client side.
- Addition of QR code scan based tracking and transaction .
- Addition of Location based tracking system for efficient pickup of waste in supply chain.
- (Optional) Simulation of iot based smart bins to automate the pick up process.