ENFACT

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Abstract - *The worldwide waste and resource challenges demand and encourage better and more long-term waste management. Resources and waste streams that were traditionally disposed of in landfills or burnt are increasingly being reused, recycled, or reclaimed. Despite the fact that numerous laws and policies have been enacted to this end, a number of persistent problems continue across interventions aimed at facilitating the essential, widespread transition to sustainable waste management. The usefulness of blockchain technology in overcoming these difficulties is explored in this viewpoint piece. We address the advantages and disadvantages of blockchain in terms of providing clarity in product and waste property rights, supporting legal and policy goals by promoting sustainable waste management, and ensuring anonymity and privacy for institutions and individuals.*

Key Words**: **Waste management, Blockchain, Ethereum, Blockchain for waste management, EnFact

1.INTRODUCTION

Blockchain technology is often referred to as the distributed ledger from to, and is the underlying technology that stores the same information on different nodes. You can add new transactions, but you cannot delete previous information, and all nodes can track the history. This makes all information available to all nodes, reducing reliance on central actors and the risk of tampering and system failure. The purpose of this study is to discuss blockchain in the government setting, with investigating the potential use of blockchain and providing a differentiated view of its use in waste management.

Waste has always been generated by human activity. Waste was not a major issue, as it was a relatively small population and nomadic. But it became a serious problem due to urbanization and metropolitan area growth. Poor waste management has caused water, soil and air pollution and has a significant impact on the health of the public. These improper waste management practices have forced governments to introduce new regulatory frameworks to address dangerous and unsustainable waste management operations.

EnFact is a blockchain-based web application that monitors registered factories and industry-disposed waste, involves NGOs in the inspection process, handles public complaints about these issues, and allows monitoring managers to monitor the entire process. The purpose of this project is to increase transparency along all stages of the waste chain to improve the waste management process. The problems solved by EnFact are removing unethical and unlawful practices by means of industries, removing unethical indulgence of Government officers with those malpractice institutions and involving NGOs to lessen corruption.

EnFact uses Smart Contracts to model relations between its internal representations of the Government, Industries, admin and public to digitize the real-world resources transferred between them.

2. LITERATURE REVIEW

Kohizade et al. Worked on the use cases and shortcomings of promoting the green supply chain through blockchain technology [1]. Lamminchane et al. [2] worked on development of smart contracts using IoT and blockchain For an intelligent waste management system. Guido et al. [3] Worked on blockchain-based smart contracts.

Pan et al. [4] worked on different aspects of the data stored in the cloud platform, they performed a variety of operations like prediction models on citizen behavior, social relation among individuals, resident behaviors and dynamics of city evolution. Infrastructure of the entire system is influenced by their behavior and also decisions made by citizens influence the waste management system. This was a core motive for proposing a customer wallet system that rewards customers based on their waste disposal behavior [5].

Gupta et al. worked on a smart contract for the e-waste disposal pattern [6]. The aim of this paper was to propose a decision-making framework to guide users of the blockchain platform on the type of objectives they need to consider and the type of services offered on such platforms for developing a legitimate service-based waste management system.

SwATEL (Swachh Adaptive Intelligence)[7] is referred to as the mind of the whole environment, as this gives the correspondence and coordination capacities between different sorts of hardwares and machinery within the ecosystem and makes them smart. SwATEL utilizes altered use of Artificial Intelligence (AI) to settle on choices in view of past learning continuously practically like people. These choices could trigger activities that are physical or computerized, which is recorded on the blockchain.

3. METHODOLOGY

NGOs work on factory or industrial inspections. A random factory is assigned each time. The factories will not be aware of the NGOs involved in the inspection and vice versa. Corruption is reduced. The factory can be registered by the admin. The factories are randomly inspected by NGOs. Inspection data is evaluated by NGOs and staff. Data is stored on the blockchain to prevent changes. The general public can also file complaints to make our goals more exemplary and ideal. They can also submit evidence stored in IPFS with your complaint. Once a complaint is filed, it cannot be tampered with or deleted along with the evidence.The admin is the governor of the entire process. They will be an official. Admin can add a new NGO / factory to our application. All reports from each inspection are stored in the blockchain and are received by the administrator. All general complaints stored on the blockchain are also received by the admin. These reports cannot be tampered.

A. Infura

Infura is a low-maintenance, easy-to-use Web3 API that serves over 350,000 developers and offers faster speeds than other IaaS providers. The Infura development suite gives scalable API access to the Ethereum and IPFS networks in real time.

B. SAWO LABS

SAWO is the only user-authentication tool that every developer would crave for. It has APIs that are fast as well as reliable, which can be integrated into any platform, and speak many languages. SAWO Labs is used for authentication of the public. It has access for 24 hours.

C. InterPlanetary File System (IPFS)

IPFS is a protocol that was created to build a peer-to-peer, content-addressable system for storing and distributing information and media files in a completely decentralised folder structure. IPFS is a shared, peer-to-peer file system whose primary goal is to connect all computing devices to a single network of files. Although IPFS is often compared to the World Wide Web, it may also be viewed as a single BitTorrent cloud that shares data with a single Git repository. This indicates that IPFS provides a content-addressed block storage concept with content-addressed hyperlinks, resulting in the development of a generalised Merkle Directed Acyclic Graph with increased throughput (DAG). A distributed hash table, an incentivized block exchange, and a self-authenticating namespace are all part of this notion.

D. Chainlink

ChainLink is a project that conveys ability to the planet of blockchains. To date, blockchain networks have existed in isolation like Bitcoin, Ethereum, Ripple, and others. Previously, there was no way to connect these blockchains alone, and to attach them to real-world information that exists outside of the blockchain.

Interoperability helps users and developers get access to variable options of various blockchains, all the while making certain that the integrity of each of the networks remains intact. Bitcoin introduced the planet to blockchains and brought the concept of decentralization thought. Ethereum then went on to unleash actual power of the blockchain mechanism victimization of sensible contracts.

ChainLink is the next step in the blockchain revolution- serving totally different chains acting with one another and with external information sources. The Blockchain is connected to external applications with the help of Chain link. On one side there's Blockchain and on the other it is integrated with an API.

E. Ethereum

It is open-source as well as a public blockchain based distributed computing platform. It features smart contract functionality. Enables distributed applications to be built and executed without any tampering, downtime, control, or interference from a third-party entity. Ethereum is a Turing-complete programming language running on a Blockchain. It helps developers in publishing distributed applications. Ethereum Blockchain Size depends solely on implementation. While Parity has an Ethereum Blockchain Size of about 6 GB, Though total Ethereum Blockchain Size might be 60GB+, in all originality.

4. DESIGN AND IMPLEMENTATION

An admin site will be available to add additional factories and NGOs to our platform. The Admin can now designate random non-governmental organisations (NGOs) to inspect factories. Chainlink VRF will assign NGOs at random in order to make the process more transparent. As a result, factories will be unable to forecast which NGO will be inspecting at any given time, minimising corruption.The designated NGO will now prepare a report detailing the factory's trash disposal statistics.The NGOs' report will be stored directly on the Ethereum Blockchain, ensuring that the data cannot be altered or tampered with by anyone.

Chatbot is integrated with voice conversations using react JS technology. It is implemented in such a way that normal users can use it efficiently as the UI is so simple. Along with that if the user is disable or can't write and ask

questions then it has a feature to enable mic and talk. it will listen and process the asked question and respond accordingly. Even if the user is not registered on the system still it will allow the user to ask questions and respond accordingly as a part of the new user and same process for users who are registered already on the system.

5. RESULT

As Blockchain technology is emerging to the market, the waste management system can benefit from the capabilities of this technology in terms of both product tracking as well as data sharing and controlling waste management behavior of households. Addressing the above stated problems, we intended to make a blockchain based web application which can, monitor the waste disposed by registered factories and industries on the application,

involving NGOs which would have a monitoring head who will involve NGOs in the process of inspection, look into the general public's complaints on these issues and have a monitoring head that could survey the whole process.

6. ADVANTAGES

1. Removes unethical and illegal practices by industries.

2. Removes government officials unethical collusion with these malpractice organisations.

3. Involving NGOs to reduce corruption.

4. Helps reduce pollution and conserve mother earth.

7. FUTURE SCOPE

The future scope of this work involves exploring other aspects of Blockchain such as involving consensus protocols at the level of individual users.

Finally, the proposed system can be integrated into other sustainability systems that reward the green with customer behavior to facilitate collection, waste recycling and waste reduction.

8. CONCLUSION

In this paper we have discussed the challenges faced in waste management. We have explained about blockchain technology and have highlighted the advantages of using blockchain to tackle these challenges and hence tried to increase transparency along all stages of the waste chain to improve the waste management process.

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