1. Problem/Background

Problem: How to accelerate growth and minimize the risk for the bioeconomy in Europe [1], coordinating climate action, regulation and cross-border inter-organisational frameworks.

Some San Juan and Battaglini (2021) [2] describe in their publication “How to mainstream sustainability and circularity into the European Union’s Energy and Climate policies.” A comparison of Blockchain and traditional practices on policies showed that the transition from a food-based economy to a bioeconomy happens at three levels: technological, organizational and social.

To the left, in three design, there are stakeholders (the environment, the consumer, and the public). Two significant challenges for Anaerobic Digestion plants were identified: (1) timing and locational 2) reliable availability of high-quality feedstock where food waste is the preferred resource. We determine that cloud architecture and computing technologies such as blockchain, IoT and AI are now available to enable technosocial solutions in the circular-systems.

Requirements: a holistic, measurable view of the bioeconmic value chain, with capacity to model existing and future challenges.

Current challenges: Incentive for all practices defined in embedded and centralised systems, communications anomalies between organisational structures, data-block chainability, lack of accountability, resource-based digital inequalities and solutions.

Future challenges: Phase of global transformation, digital sovereignty challenges, digital skills and literary deficits, and difficulties in widespread participation in the formation of a decentral administration infrastructures through cooperation.

2. European Blockchain Services Infrastructure (EBSI)

Established by European Blockchain Partnership (EBP) in 2019 to deliver EU-wide cross-border public services. By buying these NFT’s the companies show their commitment to the environment and strengthen their brand.

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2. EU-cross-border licensed waste transportation management

ISO TR 24652 in this use case, 4 assets are involved with each of their own unique computing system. Two governmental authorities, (Belgium and Dutch Government), inspection authority (BelgiumWaste) and Waste Disposal companies (Innside). The Belgian government uses a cloud-based Enterprise Resource Planning system, Dutch Government an off-premise system, inspection authority and Waste Disposal company use API-based web apps. Here they integrated a hybrid blockchain solution with a public blockchain (that transports the blockchain transaction and a public blockchain (that transports the blockchain transaction).

3. Plastic.io – Recycled polymer marketplace

A Blockchain-powered marketplace where single-use Plastic (LDPE) for recycling and resale is captured and as part of a new wave, plastic waste doesn’t end up in the environment. As a revenue stream for the recycling companies. By enabling recycling companies to sell their recycling guarantee as NFT’s on the Dutch marketplace. A marketplace for Single-Use Plastic recycling companies.

4. Technological solution to widespread participation in the bioeconomy

Open-source, cloud-architected blockchain system for friction-free onboarding and low-cost SaaS services that enable widespread community participation in the conversion of food-waste to biogas feedstock in the green bioeconomy.

Why open source? The EU ‘Think Green’ strategy promotes the sharing and reuse of software solutions, know-how and expertise, to deliver better European services that benefit society and lower costs to the society EU Open source software strategy, 2020–2023.

Why cloud? Cloud computing is a key objective to increase Europe’s data sovereignty as outlined in the European Commission’s Data Strategy, Digital Strategy, Industrial Strategy and the EU recovery plan. Cloud-based, services and API-based digital services are the emerging paradigm for software as a distributed online business model, low cost, low-friction, modular design, implementable across diverse territories, organisational boundaries and enabling within existing value frameworks.

Why Blockchain? Blockchain enables cooperative governance and oversight in multi-party business systems. Examples in supply chain include: UK food supply, supply chain finance Trade Trust, diamond provenance assurance Sentinel, trade finance management system Agrişys. Blockchain technology enables value for partners co-creating in a decentralized network, providing data integrity, access control, security, immutability, automation and enabling the transparent transfer of value and rights. Klein, S. (2018) [7].

5. Benefits and Challenges Blockchain

Benefits of a permissioned blockchain system

- Decentralized, trustless, self-organising, data-driven empowering technologies
- Cooperative oversight: synergies data measurable available, built assurance of value
- Autonomous process management: programmable smart contracts

Benefits of a permissionless system

- Transparency, open source, distributed ledger
- Uniform data standards and processes
- Automated processes: open source governance

Challenges: The early stage technology

- Low trust trust
- Multi-party interoperability deficit: connecting multiple legacy enterprise systems as a cloud service
- Cloud computing and storage value propositions for multiple actors: eg. Skills, waste disposal actors.

6. Conclusion and Recommendations

Conclusions

Blockchain serves the bioeconomy across the lifespan of the food-waste-to-renewable-energy sector will not only improve the feedstock challenge but also provide significant benefits to all parties.

We have identified a potentially high-growth and high-risk market for Blockchain-based solutions in the bioeconomy sector.

Blockchain offers a simple and secure, transparent, immutable communication channel between key participants. Once the blockchain system can be developed as a system process such as the management of waste data, and the tracking and production of other foodstuff is implemented with other software technologies such as Food Cloud to provide a complete end-to-end feedstock management solution.

Key recommendations

- Engage with key partners in the food-waste-to-energy lifecycle regarding a pilot blockchain project.
- Categorise with other horizontal technologies such as Food Cloud for integration.
- Explore other areas in the biogas or renewable energy sector for Blockchain initiatives i.e. spreading of leachate, food reduction, nutrition and bioenergy projects.
- Engage with regulatory bodies regarding the measurable sustainability indicators within the bioeconomy, including token-based solutions.
- Develop a communication and education strategy regarding blockchain and the bioeconomy. Turn to industry networks such as the FoodCloud network to distribute Blockchain-related information.
- Continue to engage with regulatory authorities in EU and Ireland regarding upcoming legislation and guidance.
- Seek funding and access to blockchain early adopter programs eg EU Blockchain Service Infrastructure.

7. References ->