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Editorial: Blockchain and tokenomics for sustainable development

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Editorial on the Research Topic

Blockchain and tokenomics for sustainable development

Introduction

The purpose of innovation is to deliver a better world to future generations. Over the past decade, the emergence of blockchain technology as a key enabler to unlock a new phase in the evolution of the Internet has attracted significant interest from both the academic (Alexopoulos et al., 2021) and the industrial world (Freni et al., 2022). As the blockchain ecosystem matures, it is important to clarify how the new breed of global infrastructure being created can be turned into value for society (Rodríguez Furones et al., 2023). The Sustainable Development Goals (SDGs), endorsed by the United Nations in 2015, offer a comprehensive framework for addressing a wide range of pressing global Research Topic, including poverty, inequality, climate change, and sustainable economic growth. The purpose of this call for scientific contributions is to investigate and evaluate how blockchain technology can be leveraged to accelerate the achievement of the SDGs.

The overarching aim of this Research Topic is to shed light on how blockchain can contribute to the attainment of a triple-sustainability paradigm within the global economy (Sch et al., 2019). It does so by encouraging the exploration of new business and governance models, along with incentive systems aimed at better allocating, redistributing, and conserving both financial and natural resources. Additionally, given the global nature of the most pressing policy challenges, there is a need to increase the level of international collaboration and coordination. In this respect, blockchain - through its transparency and immutability - can play a key role in building a layer of trust, which represents a prerequisite for any collaborative effort at both the institutional and individual levels.

This Research Topic was specifically interested in developing and strengthening original research on the emerging concept of blockchain for the development of sustainable solutions that are also connected with the current SDGs. It gathered interdisciplinary contributions that explored the potential of blockchain in addressing various

environmental, social, and economic challenges outlined in the SDGs and fostered discussions on the sustainable applications and implications of blockchain technology in achieving these global objectives. Two types of studies (review and domain-specific implementations) support the development and application of BCT.

The first type of study includes an exploratory review of token economy aspects related to BCT for local communities “Blockchain for local communities: an exploratory review of token economy aspects” (Domenicale et al.). The analysis included nine projects for systems that incentivize or reward participation or implement community currency schemes. The dimensions analyzed encompass the type of goals and communities, the blockchains adopted, and token economy design aspects such as token types, their distribution and incentive mechanisms, the associated platform/wallet functionalities, and the project governance models. We have observed a variety of combinations of these elements being used to facilitate new forms of value circulation. However, there is a tension between the aspiration to introduce transformative systems and the need to ensure the stability of the economic framework.

The second type of studies includes domain-specific contributions, including BCT developments in the domains of transportation, energy (hydrogen) production/certification, and greenhouse gas emissions:

1. “Analyzing critical success factors using blockchain-based framework for intelligent transportation systems” (Mutahhar et al.): the first study presents the case of Makkah and examines the incorporation of blockchain technology into Saudi Arabia’s Intelligent Transportation Systems (ITS), focusing on enhancing the bus permission procedure for religious mass gatherings. The research examines the impact of the reformulated CSFs on the proposed blockchain-based transportation framework (BTF), emphasizing key domains such as people (P1), technology (P2), the environment (P3), and organization (P4). The findings indicate that blockchain-related CSFs exhibit the greatest influence, which is 21.62, while financial CSFs have the least influence at 0.25. This research significantly addresses current system limitations and stimulates wider blockchain usage inside Intelligent Transportation Systems by developing a thorough mathematical model.
2. “Is it green? Designing a blockchain-based certification system for the EU hydrogen market” (Schmid et al.): this study designed and implemented a blockchain-based certification system (BLC-CS) for green hydrogen through collaboration with experts to gather requirements and conduct evaluations. The artifact streamlines the certification process for producers, regulators, and consumers. It facilitates information gathering, verification, and reporting, contributing to the advancement of sustainable energy practices.
3. “Tokenized carbon credits in voluntary carbon markets: the case of KlimaDAO” (Ballesteros-Rodríguez et al.): within the decentralized financial ecosystem, Decentralized Autonomous Organizations leverage the tokenization of carbon credits to enhance efficiency and transparency. KlimaDAO, established in August 2021, aims to accelerate the adoption of carbon markets by integrating blockchain technology to facilitate transparent, secure, and accessible carbon trading. This

study analyzes the evolution of KlimaDAO by evaluating its market capitalization, token prices, stacking participation, carbon credit retirements, market participation, and concentration. The analysis reveals that while KlimaDAO initially achieved significant engagement and activity, it now faces challenges associated with market maturity and participant retention. Finally, the study highlights the importance of standardization and regulatory frameworks to enhance interoperability, transparency, and legitimacy within the tokenized carbon market.

Conclusion

The studies presented provide valuable insights (examination of 12 different projects/applications in the BCT domain) into the application of blockchain technology (BCT) across diverse domains, highlighting both its transformative potential and the challenges it faces. The studies reveal the versatility of BCT in fostering innovation, improving efficiency, and promoting transparency across different sectors. However, they also highlight the necessity for further research and the development of robust frameworks to address existing limitations and ensure broader adoption and sustainability. With respect to tokenomics, there are innovative ways in which blockchain systems facilitate the circulation of value through various combinations of token types, incentive mechanisms, and governance models. However, the tension between driving transformative change and maintaining economic stability remains a critical challenge. Finally, all of the reviewed projects are well connected to different SDGs, most notably SDG 11: Sustainable Cities and Communities, SDG 7: Affordable and Clean Energy, SDG 12: Responsible Consumption and Production, and SDG 13: Climate Action.

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