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# Editorial: The role of blockchain technology toward a sustainable energy future

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## KEYWORDS

blockchain, energy, sustainability, mathematical modelling, decision making

## Editorial on the Research Topic

The role of blockchain technology toward a sustainable energy future

## 1 Introduction

*The role of blockchain technology toward a sustainable energy future.* Blockchain is an innovative, decentralized, advanced technology that maintains the confidentiality, integrity, and availability of all transactions and data. Blockchain is a distributed ledger that can store data records and transactions backed by cryptographic value through a peer-to-peer network. All transactions supported by Blockchain are efficient, secure, economical, and transparent. Moreover, Blockchain helps with the real-time automation of production systems with smart contract implementation. Therefore, the system's efficiency is expected to increase after the implementation of Blockchain, leading to reduced total costs. Considering the challenge of providing clean and cheap energy worldwide, this technology must help economize the energy supply.

The biggest threat in implementing Blockchain is identity management and robust cyber security, which can be solved by integrating Blockchain with cloud technologies to improve the cloud network's security and scalability. Moreover, Blockchain helps create trading energy systems where distributed agents can directly interact with each other in a flat and non-flat trading system. It provides a decentralized and distributed accounting mode to continue according to the current needs of the distributor in the energy market by dividing the transaction process into two stages: auction and conversation. Blockchain can ensure that energy is effectively used and supplied and that its allocation is efficient and transparent. This directly increases social welfare.

### 1.1 Aims and scope of the Research Topic

The main aim of this Research Topic is to develop new approaches for enhancing the role of blockchain technology in a sustainable energy future closely related to affordable and clean energy.

This Research Topic highlights Blockchain's role in the Energy industry. It seeks to clarify how advances in artificial intelligence and optimization methods can effectively go through energy consumption management, emphasizing blockchain applications in complex decision-making. This Research Topic provides a valuable compilation of several challenging problems in Blockchain's role in the energy industry.

## 2 Selected papers in this Research Topic

Thanks to the great support from the Editor-in-Chief and the dedicated work of numerous reviewers, we could accept five excellent articles with eleven authors covering various topics on *The role of blockchain technology toward a sustainable energy future*.

**Lu** included a thorough summary of the intricate connection between energy and the economy and the urgent need for sustainable energy solutions. An assessment is conducted on the financial advantages of switching to sustainable energy technologies, including enhanced energy security, less reliance on fossil fuels, and the possibility of greater economic growth. An important addition to the body of knowledge on sustainable energy is the in-depth analysis of the intricate interaction between the economy and energy. By encouraging the development of sustainable energy technology, this study helps to create a more sustainable global economy. In summary, switching to sustainable energy technology's is essential for both environmental and financial sustainability. Still, it also presents several obstacles that call for coordinated action by businesses, governments, and academic institutions. An energy shift that is sustainable can be facilitated by promising technologies like Blockchain and legislative adjustments that reward renewable energy. Promising financial gains and opportunities for employment growth in the sustainable energy industry are presented by this shift. The knowledge gained from this research can help shape strategies and policies that support renewable energy technologies and strengthen the foundation of a more resilient and sustainable economy.

**Weixiong** evaluated the dangers and problems associated with blockchain technology and how it may be fully utilised to enable sustainable energy futures and improve security and efficiency in China's securities market. Through embedded supervision, the Chinese regulatory authorities can build and improve a regulatory framework for blockchain financial infrastructure by utilising the technological features and organisational structure of Blockchain, according to the findings of this study.

**Zhang et al.** studied Chinese firms from 2010 to 2019 and analysed the impact of innovation heterogeneity, including overall, product, and process innovation and the mediating role of specialization. This study highlights the importance of understanding different types of innovation and their complementary effects on hidden champions' growth potential, thereby enabling firms to develop comprehensive innovation strategies for enhanced growth. This study explores blockchain technology's potential, innovation's role, and specialization's role in sustainable energy industry growth. It provides insights for firms and policymakers, emphasizing the mediating role of specialization and aligning innovation with core competencies. The findings guide firms and policymakers in fostering sustainable energy development.

A study by **Ziya and Guo** found that low-carbon technology innovation positively impacts sustainable development performance

in listed Chinese energy companies, with dual legitimacy playing an intermediary role. This study offers guidance for integrating low-carbon innovation and legitimacy theory. The study examines low-carbon technological innovation practices in energy enterprises, focusing on regulatory and institutional pressures. Future research could explore multiple subjects' low-carbon innovation behaviour to provide comprehensive suggestions for constructing China's low-carbon energy system.

**Pan et al.** propose a cloud computing framework to improve blockchain-based PV logistics. The model optimizes transportation, storage, inventory management, and supply chain coordination to reduce costs and enhance efficiency. However, the research's limitations include its focus on blockchain-based systems and not addressing potential challenges and costs associated with cloud adoption. The proposed framework aims for more resilient, cost-effective, and competitive PV logistic systems.

## 3 Conclusion

This editorial presented some aspects of the Role of Blockchain Technology Toward Sustainable Energy Future relevance, including technology, organizations and people, and the impacts during emergency situations and economic uncertainties. People's actions and lifestyles must be changed to achieve a sustainable energy future. Several current activities, such as energy from non-renewable, fossil sources, are unsustainable. Mathematical optimization and statistical analysis methods have helped support micro-and macroeconomic decision-making. Finally, we provide insightful research directions for scholars, practitioners, and government.

## Author contributions

AG: Writing—original draft, Writing—review and editing. DB: Writing—review and editing. FZ: Writing—review and editing. IA: Writing—original draft.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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