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SUSTAINABILITY

Combatting climate change, one block at a time...

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Blockchain, the decentralised database that stores information electronically on a computer network, is synonymous with using large quantities of electricity to effect transactions on the database.

[1] The database is not stored on a single terminal but rather on multiple terminals of high-powered computers, referred to as nodes, with each node distributing updated information on the blockchain in real-time.

[2] With blockchain's extensive carbon footprint through the use of mostly fossil fuel-derived electricity, the question is whether blockchain can ever meet sustainability requirements and contribute to combatting climate change.

Blockchain transactions and climate change

Blockchain transactions are characterised by transparency, automation, data auditability, and process efficiency.[3] The aforementioned is possible as blockchain collects information together in "blocks" of information, with each "block" having a certain storage capacity which once filled will close and form a link with the previous "block".[4]

In this way, all the information in respect of a transaction is contained in an interlinked chain of information, which can be retrieved, certified, and verified by other blockchain users.

Blockchain users that retrieve, certify and verify the information contained on blockchain make use of, *inter alia*, artificial intelligence and statistical analysis to compute complicated algorithms to solve complex mathematical equations to extract actionable knowledge from the database.[5]

In recent years, the popularity of blockchain and cryptocurrencies have contributed substantially to increased greenhouse gas emissions.

More consumers are making use of blockchain to not only transact but also to "mine" cryptocurrency (i.e. solve complex mathematical equations), which results in increased competition to be the first consumer to certify and/or verify the authenticity of a transaction that occurs on blockchain to reap the rewards associated with such certification and verification through the proof-of-work system.[6]

The aforementioned has also resulted in a lot of wasted electrical and computational energy, as thousands of other consumers attempt to be the first to certify and/or verify the transaction, only to fail.

Combatting climate change and supporting sustainability

The United Nations (UN) Environment Programme has identified three areas in which blockchain can facilitate climate change and sustainability, namely

(i) transparency (as set out below);

(ii) climate finance (which relates to investments that slow climate change) and

(iii) clean energy markets.[7]

Although blockchain, in general, currently has an extensive carbon footprint, it can play an important role in sustainability, which is evidenced by the use of blockchain by some international humanitarian organisations. A key element associated with blockchain is the transparent

nature of information contained on the blockchain.

The UN has posited that transparency is arguably one of the most useful aspects of blockchain, especially in relation to the UN's World Food Programme, which has found that blockchain can ensure that humanitarian cash donations are received by those individuals who are in need.[8]

The World Wide Fund for Nature (WWF) has also in recent years developed CarbonX, a platform that creates cryptocurrency from the reduction in greenhouse gas emissions, which is bought and sold and provides financial incentives to manufacturers and consumers to make more sustainable choices.[9]

It goes without saying that computer-based technological advances have influenced the development and mobilisation of various sectors, including the finance sector.

Blockchain has facilitated the development of new financing platforms, which not only analyse the information contained on existing blockchain transactions to predict trends in financial markets but also to lower the costs associated with future financial transactions.[10]

Blockchain technology

Blockchain technology can also bring more visibility to environmental, social and governance issues, by tracking data and assessing the performance and compliance of individuals who conclude transactions on blockchain.[11]

Blockchain facilitates innovative transactions, which is evidenced by, for example, the Power Ledger in Australia (Power Ledger)[12] and the partnership between Take Energy Corporation and Electrify in Japan (Electrify Partnership).[13]

Power Ledger, launched an electricity management technology system which allows commercial buildings in rural areas of Western Australia to trade and exchange excess electricity between each building on the designated blockchain.

Similarly, the Electrify Partnership has developed a blockchain-based peer-to-peer energy trading platform, which enables consumers to exchange and trade excess solar energy.

Consequently, blockchain has and may continue to decentralise the electricity trade and exchange by promoting and incentivising the move towards more sustainable sources of electricity generation, which combats climate change, and may even facilitate commitments to smaller carbon footprints.[14]

After years of development, Ethereum (a decentralised software platform powered by blockchain technology, which can support both Bitcoin and Ether cryptocurrencies), completed The Merge.

The Merge combines the proof-of-work and the proof-of-stake systems to verify and authenticate transactions on the blockchain.[15] The proof-of-stake system requires blockchain users to pledge an investment from their own digital wallet (approximately 32 Ether tokens) before they are allowed to validate and certify transactions.[16]

The choice of who may validate the transaction is determined through a random selection using a weighted algorithm, the weighting of which is based on the stake and the blockchain user's validation experience.[17]

In this way, one blockchain user verifies the blockchain transaction and in return receives a fee and their original stake, which decreases the electricity required to verify the transaction. The proof-of-stake system also disincentives blockchain user's from committing fraud while verifying transactions, as the blockchain user stands to lose their original stake.

The co-founder of Ethereum, Vitalik Buterin, has mentioned that The Merge has lowered the world's energy consumption by about 0.2%, which is one of the single biggest decarbonisation efforts in history to date, as the overhaul of Ethereum has reduced Ethereum's energy use by at least 99.988% and carbon emissions by at least 99.992%.[18]

It is evident that The Merge may encourage other crypto platforms to follow suit to lower the energy consumption and carbon emissions associated with using these crypto platforms.

Conclusion

Blockchain may have a significant environmental impact owing to the quantity of electricity required to facilitate transactions on the database, however, recent developments and advances in blockchain technology have demonstrated a shift towards sustainability and lower carbon

emissions which have resulted in blockchain technology contributing to sustainability and climate change.

The Merge has shown that sustainability and lowered carbon emissions may be on the horizon for other crypto platforms. Even though blockchain uses large quantities of electricity to process transactions on the database, alternative electricity sources are being investigated to power blockchain transactions.

The information contained in the interlinked "blocks" of blockchain contains valuable information, which with the advances in artificial intelligence and processing capabilities of complex algorithms may encourage trends which may contribute towards combatting climate change one "block" of information at a time.

Footnotes

[1] Iliakis K *et al.* "*GPU accelerated blockchain over key-value database transactions*" (2022). https://doi.org/10.1049/blc2.12011 [accessed 28 July 2022]

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[4] https://www.gemini.com/cryptopedia/what-is-block-in-blockchain-bitcoin-block-size [accessed 28 July 2022]

[5] Deepa N *et al.* "*A Survey on Blockchain for Big Data: Approaches, Opportunities, and Future Directions*" (2020). https://arxiv.org/pdf/2009.00858.pdf [accessed 27 July 2022]

[6] https://www.investopedia.com/terms/b/blockchain.asp [accessed 28 July 2022]

[7] Page 4 of the United Nations article titled "*Sustainability solution or climate calamity? The dangers and promise of cryptocurrency technology*" (2021)

[8] Page 2 of the United Nations article titled "*Sustainability solution or climate calamity? The dangers and promise of cryptocurrency technology*" (2021)

[9] Page 3 of the United Nations article titled "*Sustainability solution or climate calamity? The dangers and promise of cryptocurrency technology*" (2021)

[10] Chang V *et al.* "*How Blockchain can impact financial services – The overview, challenges and recommendations from expert interviewees*" (2020)

[11] Allena M "*Blockchain Technology for Environmental Compliance: Towards a 'Choral' Approach*" (2019)

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[15] Nambiampurath R "*Ethereum Finally Completes The Merge*" (15 September 2022)

[16] Calma J "*How The Merge will slash Ethereum's climate pollution/ If The Merge is successful, it will drastically shrink the cryptocurrency's energy use*" (7 September 2022)

[17] Hetler A "*Proof of work vs. proof of stake: what's the difference?*" (1 August 2022)

[18] Ashraf A "*Vitalik Buterin Says Ethereum Merge Cut Global Energy Usage by 0.2%, One of Biggest Decarbonization Events Ever*" (15 September 2022)



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