

# Chapter 10

## Examining Cryptocurrencies Within the Framework of Sustainability

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### ABSTRACT

*Cryptocurrencies have been attracting a significant amount of attention in the world since they were first launched in 2009. Pretending to be a decentralized finance solution, it brought out a new era in technology called blockchain. Even though the benefits did not come into action in daily routines for many to be aware of, the market and its variety kept growing. On the other hand, there are also a lot of concerns and unpredictability about the future of this technology. Especially the high energy consumption while generating blocks for mining cryptocurrencies and completing transactions is commonly being criticised. In this study, blockchain technology and the basics of mining and validation procedures such as proof of work (PoW) and proof of stake (PoS) processes will be explained, and the environmental effects of bitcoin mining will be investigated. In the perspective of environmental sustainability of cryptocurrencies, the improvement in usage of renewable energy and its side benefits will be overviewed for a better prediction on the blockchain technology future.*

DOI: 10.4018/978-1-6684-6620-9.ch010

## INTRODUCTION

People used metals as a means of payment, coins and paper money, respectively, as a means of payment for the purchase of goods and services. In Prehistoric times, people used to mine precious metals for exchange purposes. In today's internet age, the concept of mining has gained a new meaning that Bitcoin's are started to be extracted from the internet, unlike the precious metals extracted from the earth. Bitcoin's are a digital currency that operates independently of central banks. Encryption algorithms are the formulas of the production of cryptocurrencies and exists as the key elements for verifying the transactions. To mine blockchain, a user needs to create new transactions and solve a complex mathematical puzzle. Thus, these transactions are verified by adding new blocks to the chain (Bitcoin Mining, Investopedia).

Bitcoin has been an important digital currency of the financial industry since it was conceived in 2008 by an author who names himself as Satoshi Nakamoto to "produce a medium of exchange that can be transferred electronically, securely, verifiably and immutably, independent of any central authority." Blockchain, which works on a decentralized public ledger, provides online transfers to be done directly between users without a need of a financial authority thanks to its pure peer to peer structure. (Nakamoto, 2008).

Generation of new bitcoins is limited with 21 million and this process is controlled by an algorithm. Until then, system is designed to a new bitcoin to be generated every hour. Since the peer - to - peer network limits the amount of Bitcoin in circulation thanks to the blockchain, the limited supply of Bitcoin instead of an unlimited amount of state-backed nominal currency makes it considered a more attractive asset (Cryptocurrency).

## LITERATURE REVIEW

People have been using various currencies for thousands of years. Initially, currencies were produced directly from precious metals such as gold and silver, but later paper money was used. While cryptocurrency markets have grown in recent years, their sustainability continues to attract the attention of academic researchers because they require high energy consumption and create environmental concerns around the world.

Li et al. (2019), examined the electricity consumption of Monero mining and carbon emissions in China in the study in which they analyzed the power consumption and mining efficiency of 9 digital currencies. According to the results of the analysis, it was calculated that Monero had an electricity consumption of 30.34 GWh in China and 645.62 GWh at the global level in the April-December period of 2018, while the carbon dioxide emission in China was at the level of 19.12 thousand tons. According to the results, although blockchain technology and cryptocurrency mining are promising, it seems possible for it to reach alarming dimensions for energy consumption and sustainable development.

Stoll et al. (2019), calculated the carbon dioxide (CO<sub>2</sub>) emissions of energy consumption by estimating the energy consumption of the Bitcoin blockchain. According to the findings presented, the electricity consumed was 45.8 TWh as of November 2018, leading to carbon dioxide (CO<sub>2</sub>) emissions of around 22.0 to 22.9 MT. It is stated that the emission values obtained are equal to the amount of carbon dioxide (CO<sub>2</sub>) emissions of Jordan and Sri Lanka.

Mora et al. (2018), reported that if its current technological use continues, bitcoin mining will cause a 2°C of global warming in next few ten years. While it is stated that miners will always chose the loca-

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