

Evasion of Carbon Footprints in Cryptocurrencies and Its Prospect Around the Globe

Sonali Tiwari^{1*}, Pratik Jangam², Trupti Dave³

Abstract

The main aim of this study is to determine the evasion of carbon emission in use of cryptocurrency across the world. Stopping global warming caused by the humans is crucial if we want to assure a sustainable future. While nations all over the world are actively working toward the sustainability goals, CO₂ levels are gradually growing. The annualized energy usage of some crypto assets, like bitcoin, is projected to be comparable to that of some mid-sized countries, leaving a considerable carbon footprint. Their underlying blockchain technology, which necessitates enormous quantities of processing power, is the primary cause of this disproportionate carbon impact. Not just this but financial system climate transition risk is rising as a result of growing financial exposure to crypto-assets with large carbon footprints. These digital assets' value is particularly susceptible to local governments' climate policies and the effects of the move to net zero. Due to the current surge in energy prices during the Russia–Ukraine war, jurisdictions may also focus more intently on the effective use of various energy sources. It appears unclear that bitcoin investors have currently factored in the harmful ecological externalities and any policy changes from the government.

Keywords: Cryptocurrency, evasion, world, government, bitcoin

INTRODUCTION

The cryptocurrency is a digital currency (Figure 1). With the exception of the fact that it uses encryption rather than having a physical form, it resembles actual money quite a deal.

Since cryptocurrencies are run by no central authority or bank, new units can only be introduced after specific conditions have been met. After a block is added to the blockchain and a new bitcoin is generated, the miner who did the work receives compensation in the form of newly created bitcoins.

Cryptocurrency, also known as crypto or digital currency, refers to any form of money that exists in a digital or virtual form and uses encryption techniques to secure transactions. Unlike traditional fiat currencies that are governed by a central authority, cryptocurrencies operate through a decentralized

process that enables transactions to be recorded and new units to be created. Nevertheless, the number keeps increasing [1]. As a result, demand for blockchain developers is increasing (the underlying technology of cryptocurrencies such as bitcoin). As indicated by the compensation they earn, blockchain developers are held in high regard [2]: According to Indeed, the typical salary for a full-stack developer is more than \$112,000 per year. There is even a dedicated webpage for cryptocurrency employment. Cryptocurrencies are digital data strings that serve as a substitute for traditional exchange units. They are tracked and

*Author for Correspondence

Sonali Tiwari
E-mail: sonali.tiwarimms21-23@atharvaims.edu.in

¹⁻³Student, Management Studies, Atharva Institute of Management Studies, Mumbai, Maharashtra, India

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organized by decentralized peer-to-peer networks called blockchains, which not only facilitate buying, selling, and transferring transactions but also ensure their security through encryption technology. Thus, cryptocurrencies can serve as both a medium of exchange and a ledger system for recording transactions [3].



Figure 1. Cryptocurrency.

The barter system, which involves the exchange of goods and services between parties, existed prior to the emergence of modern humans. For instance, trading seven apples for seven oranges is an example of bartering. However, the barter system has flaws, which led to its decline [4]. One of these is the requirement for mutual compatibility between the parties involved in a trade; each party must have something that the other wants. Additionally, because not all items can be divided into smaller parts and their values are subjective, determining the worth of each item can be challenging, making bartering less convenient than traditional currency-based transactions. For instance, it is impossible to separate a live animal into smaller pieces. The commodities cannot be transported as readily as our current currency, which may be stored on a mobile device or placed in a wallet.

Many alterations were made to the currency as people realized that the barter system wasn't very efficient: A legal currency was first created in 110 BC; then, gold was introduced and used in Europe, and then the paper money was widely used from 1600 to 1900. The development of contemporary money as we know it may be traced back via this history [5].

DATA COLLECTION METHOD

Self-made questionnaires was collected by the Google Forms.

Method

A cross-sectional descriptive study was conducted across all the people.

The assessment instruments were as follows:

1. Questionnaire that contains the question about the knowledge of cryptocurrency and its harmful effect on environment
2. Evasion of the carbon footprints in cryptocurrency
3. Why investors are not investing in cryptocurrency

Research Design

Descriptive research design

Sampling Size

Sampling size referring to the number of respondents included in a study represents people.

Sampling Unit

Units selected for the purpose of sampling are people of different age, firm, and students.

Sampling Procedure

Sampling techniques done according to the convenience and snowball sampling method.

DATA COLLECTION

1. Data collection is done through primary data by a self-made questionnaire in Google Forms
2. Data collection is also done through secondary data by referring to various research papers, books, magazines, and online data.

Scope of the Study

The purpose of this study was to determine the evasion of carbon footprint found in cryptocurrency, how was it detected, by whom was it detected and its worldwide spread across the country and its effect on environment.

HOW DOES CRYPTOCURRENCY WORKS

Cryptocurrency is a digital currency that does not require banks to verify transactions. Transactions are encrypted and validated through complex code, which provides security and protection. Transactions are recorded as digital entries on a public ledger. Digital wallets are used to store cryptocurrency. The peer-to-peer technology allows anyone, anywhere to send and receive payments. Bitcoin is the first and most well-known cryptocurrency invented in 2009. The financial trading accounts for a significant percentage of interest in cryptocurrencies, and blockchain is the distributed public ledger that is updated and maintained by currency holders.

Mining, a process that utilizes computer power to solve mathematical problems, creates units of bitcoin. Holding cryptocurrencies does not equate to ownership, but rather provides the ability to transfer data or units of measurement without the need for an intermediary. Users can also buy and store cryptocurrencies in digital wallets for later use. Blockchain technology and its financial applications are constantly evolving with potential future uses including the trading of bonds, stocks, and other financial assets (Figure 2).

DIFFERENT TYPES OF CRYPTOCURRENCIES

Bitcoin, created in 2009, is the first and most popular cryptocurrency. Its creator remains unknown. Ether (ETH), also known as Ethereum, is the digital currency used by the Ethereum blockchain platform, launched in 2015, and is the second most popular cryptocurrency. Litecoin is similar to bitcoin, but with a focus on faster transactions and more frequent updates. Ripple, developed in 2012, is a distributed ledger technology that tracks cryptocurrency transactions and is also a platform for other uses, such as working with banks and financial institutions. Non-bitcoin cryptocurrencies are often called “altcoins” to distinguish them from the original (Figure 3).

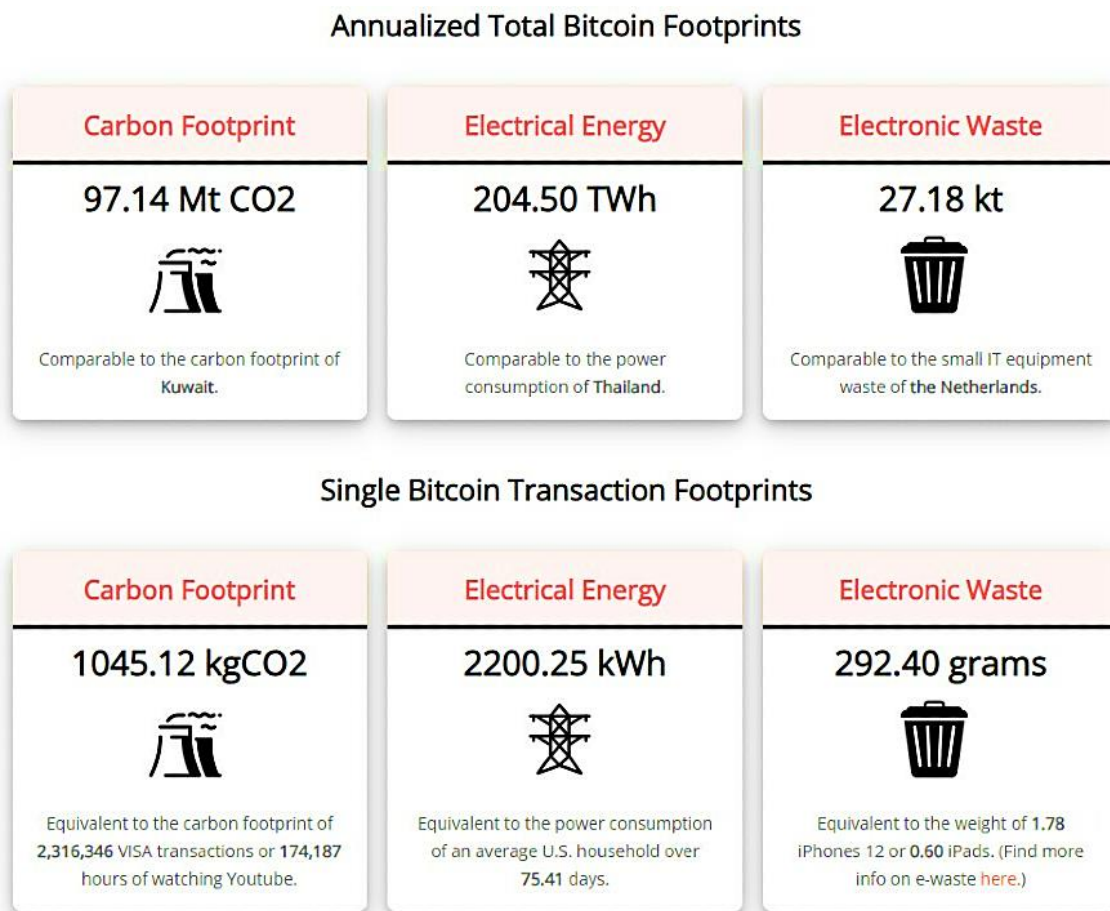


Figure 2. Working of cryptocurrency.



Figure 3. Types of cryptocurrencies.

MANY DIFFERENT COUNTRIES USE CRYPTOCURRENCIES

Nigeria’s distinctive culture and circumstances, according to Bitcoin.com, are promoting the trend. One of the biggest issues is poverty and cryptocurrency transactions are cheap. The fact that Nigerians use mobile payments and money transfers much more frequently is another factor for the development. Not to mention that double-digit inflation is more common than not in Nigeria, where virtual currencies like Bitcoin, which have a finite number of coins available, operate as a hedge against inflation (Figure 4).

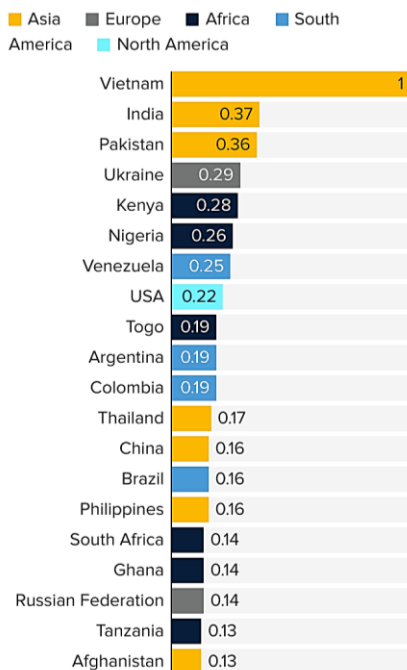
According to statistical information provided by websites, the percentage of cryptocurrencies that are most commonly used is:

- Nigeria: 32%
- Vietnam: 21%
- Philippines: 20%
- Turkey: 16%
- Peru: 16%
- Switzerland: 11%
- India: 9%
- China: 7%
- The United States: 6%
- Germany: 5%
- Japan: 4%

The Chainalysis 2021 Global Crypto Adoption Index

Top 20 countries, based on three metrics: Total crypto activity, trading activity of non-professional users, and peer-to-peer exchange trade volume. All are weighted by purchasing power parity per capita.

Countries are scored on a scale of 0 to 1.



Source: Chainalysis



Figure 4. Cryptocurrencies analysis.

SAFETY CONCERNS OF CRYPTOCURRENCIES

Typically, cryptocurrencies are made using the blockchain technology. The blockchain technology ensures that bitcoin transactions are recorded in a secure and unalterable digital ledger. The authentication process for transactions involves multiple layers of security, such as username, password, and an authentication code sent to a personal cell phone.

Transactions are time-stamped and organized in blocks, making it difficult for hackers to manipulate the system. Despite these measures, the security of cryptocurrencies is not foolproof, and there have been costly hacks in the past. Coincheck and BitGrail were the largest cryptocurrency hacks of 2018, resulting in the loss of hundreds of millions of dollars. Additionally, the value of virtual currencies is not backed by the government and is based solely on supply and demand, leading to significant fluctuations in value and potential gains or losses for investors. However, government regulation of cryptocurrency assets occurs much less frequently than it does for traditional financial instruments like stocks, bonds, and mutual funds.

WHAT IS CRYPTOCURRENCY MINING AND HOW DOES IT WORKS

Proof-of-work is a consensus algorithm used by many cryptocurrencies, including bitcoin, to verify and add transactions to the blockchain. The process involves solving complex mathematical problems that require significant computational power. Miners use their computers or specialized mining equipment to compete in this race to solve the problem first.

The first miner to solve the problem and verify the transaction is rewarded with new coins and transaction fees. This process is designed to ensure that transactions are validated and added to the blockchain in a decentralized and trustless manner.

However, the high energy consumption required by proof-of-work algorithms has been a subject of criticism. The large amount of electricity used by mining operations has led to concerns about the environmental impact and sustainability of cryptocurrencies. As a result, some cryptocurrencies are exploring alternative consensus mechanisms that require less energy, such as proof-of-stake.

One alternative to the proof-of-work consensus mechanism used by bitcoin and other cryptocurrencies is proof-of-stake. In proof-of-stake, validators are chosen to validate transactions based on the amount of cryptocurrency they hold and “stake” as collateral. This approach requires less energy than proof-of-work because validators do not need to compete to solve computational puzzles. Instead, they are incentivized to act in the best interests of the network by risking their own stake.

Another issue with proof-of-work is that it can lead to centralization of mining power. As mining becomes more competitive, miners may consolidate into larger pools to increase their chances of winning the reward. This can result in a few mining pools controlling a significant portion of the network’s computational power, which can make the network vulnerable to attacks or manipulation.

Finally, some cryptocurrencies are exploring alternative consensus mechanisms altogether, such as proof-of-authority or proof-of-reputation. These approaches rely on trusted validators or reputation scores rather than computational puzzles to validate transactions. While these mechanisms may offer benefits in terms of energy efficiency and security, they may also introduce new challenges such as centralization or the potential for collusion among validators (Figure 5).

Four different channels are used by cryptocurrency miners to obtain their electricity:

1. Direct acquisition of power facilities that provide energy to mining rigs “behind-the-meter”;
2. Power purchase agreements with utilities or power producers;
3. Purchasing electricity from a local utility; and
4. By gas combustion at gas and oil wells. Every mining method results in excessive emissions and has an effect on power and energy users.

What is Bitcoin Mining?

How Bitcoin Transactions work

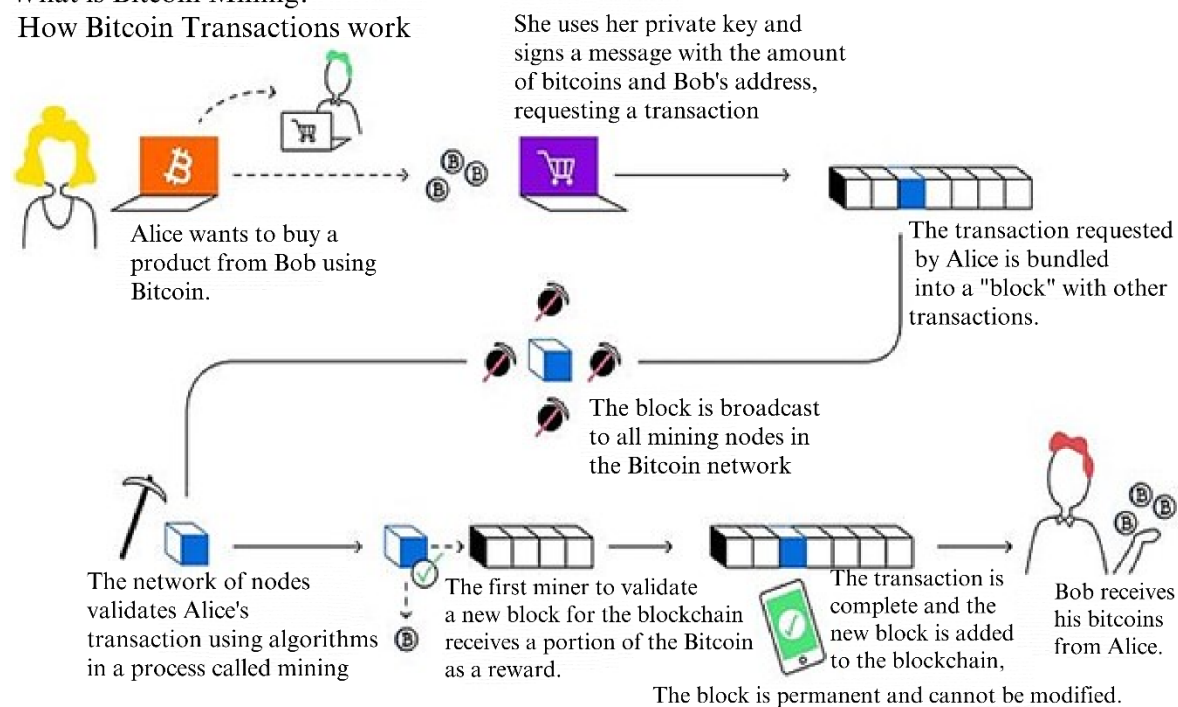


Figure 5. Bitcoin mining.

EFFECT OF CRYPTOCURRENCY MINING

The process of cryptocurrency mining is known to consume large amounts of energy, which can have negative consequences for efforts to reduce reliance on fossil fuels and combat global warming. Bitcoin mining alone consumes more energy than entire countries such as Argentina or Norway. The environmental impact of cryptocurrency mining has become a growing concern in recent years, as the demand for cryptocurrencies continues to rise. Some countries have even started to impose regulations on cryptocurrency mining in order to reduce its carbon footprint. For example, China, which used to be the hub of cryptocurrency mining due to its cheap electricity, has recently started to crack down on mining operations in an effort to reduce carbon emissions. Mining cryptocurrencies with fossil fuels has increased regional noise, air, and water pollution as well as costs for others and climate change. The fast growth of cryptocurrency mining industry puts a strain on energy infrastructure, causing an increase in electricity prices and pollution levels on both local and global scales. Most bitcoin mining companies have not shown much inclination towards investing in clean energy sources, unlike other significant power consumers, and tend to have short-term goals.

How was Carbon Footprint Detected in Cryptocurrency

The carbon footprint of Bitcoin, the largest cryptocurrency in the world, is comparable to that of New Zealand, according to data from the Bitcoin Energy Consumption Index from Digiconomist, an online tool developed by the data scientist Alex de Vries. Every year, bitcoin and ethereum mining activities together result in the release of more than 37 megatons of carbon dioxide into the atmosphere. It is worth noting that except for the bitcoins created by the creator Satoshi Nakamoto via the genesis block, all the other bitcoins were mined. Although the Bitcoin network can still operate without miners, it will not produce any new bitcoins. Cryptocurrency mining uses a lot of fossil fuels, which causes environmental harm and increases global carbon emissions (Figures 6 and 7).

Future of Cryptocurrency

There is a distinct divide in the world when it comes to cryptocurrencies. On one side of the argument are proponents of the notion that cryptocurrencies are better than traditional currencies, such as Bill

Gates, Al Gore, and Richard Branson. Warren Buffet, Paul Krugman, and Robert Shiller are among the many critics of cryptocurrencies. Buffet, one of the world's most successful investors, has called bitcoin a "gambling device" with "no unique value at all." Krugman, a Nobel laureate in economics, has referred to cryptocurrencies as a "bubble wrapped in techno-mysticism inside a cocoon of libertarian ideology." Shiller, another Nobel laureate in economics, has expressed concerns about the volatility of cryptocurrencies and their potential for being a speculative bubble. These critics have all raised valid points and highlighted some of the challenges and risks associated with cryptocurrencies. Krugman and Shiller, both recipients of the Nobel Prize in economics, consider it to be a Ponzi scheme and a cover for criminal activities.

Regulation and anonymity are going to clash in the future. The tension between government regulation and user anonymity is a major challenge for the widespread adoption of cryptocurrencies. While some governments may see the need to regulate cryptocurrencies due to concerns over their potential use in criminal activities, such regulation may also undermine the privacy and security features that are central to the appeal of cryptocurrencies for many users.

Despite these challenges, some experts predict that cryptocurrencies will become increasingly mainstream over the next decade. By 2030, some estimates suggest that cryptocurrencies could represent up to 25% of all national currencies as more people become comfortable with using them as a form of payment. However, the speed and extent of this adoption will depend on a range of factors, including the development of more user-friendly interfaces and the resolution of regulatory uncertainties. Prices will continue to vary as they have for the previous few years because of its volatile nature, and both businesses and consumers will continue to tolerate it more and more (Figure 8).

LITERATURE REVIEW

These tokens are designed to operate on a decentralized network and do not rely on a single institution to issue or validate transactions. The blockchain technology that underpins most cryptocurrencies ensures that all transactions are securely recorded and verified through a decentralized network of nodes. This eliminates the need for a central authority to manage transactions, which is one of the key features of cryptocurrencies. Additionally, cryptocurrencies like Bitcoin and Ethereum have a limited supply, which means that they cannot be inflated like traditional fiat currencies.

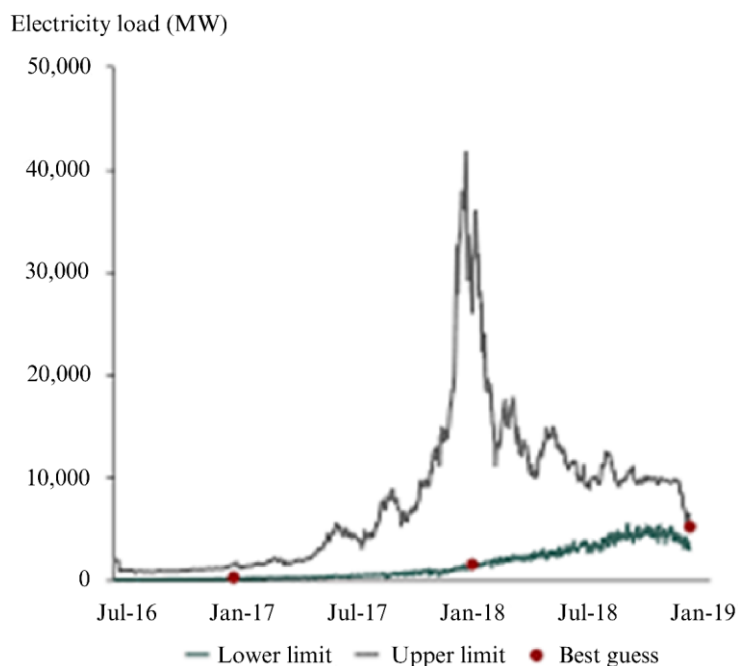


Figure 6. Bitcoin energy consumption graph.

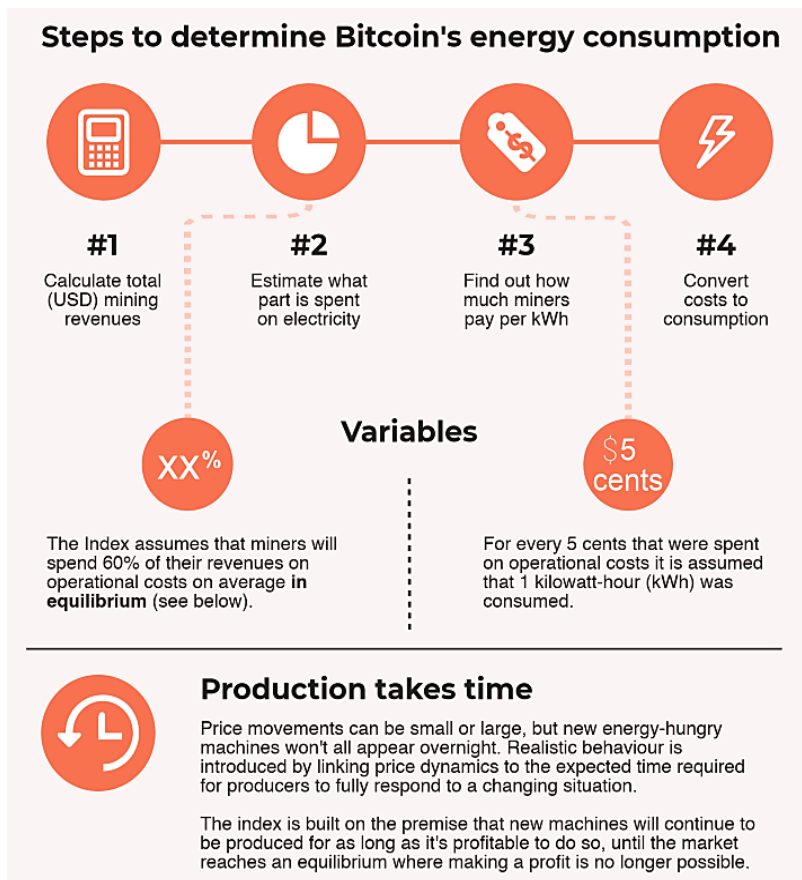


Figure 7. Bitcoin energy consumption index.



Figure 8. Cryptocurrencies in mainstream.

Then, this token is sent across the internet via protocols like peer-to-peer networking. Its value is mostly determined by the supply and demand for similar tokens, and a key factor in their attraction is the decentralization of the system in which they are used. Different regulators have reacted differently

to the innovation as a result of the general discussion surrounding cryptocurrencies, and the financial technology sector has disagreed regarding whether or not cryptocurrencies would eventually be used widely [6].

However, decentralized currency schemes, according to Karlstrom [7], are based on a network of transaction partners and attempt to bypass central institutions as much as possible. As long as the parties to the transaction can see each other's behaviors, they can develop trust. To establish trustworthy transactions, alternate means must be established if observation of the transaction participants is not feasible. Cryptocurrencies, which are decentralized payment systems based on encryption, are one potential solution.

According to Harvey [8], virtual currencies offer several advantages, including enhanced security features, ease of use on mobile devices, low production and transmission costs via the blockchain protocol, and reduced risks of long-term inflation. Global financial institutions like Citibank are creating their own coin because they believe using the aforementioned protocols will have these advantages.

Virtual currencies have become increasingly popular and are used all around the world. The decentralized nature of cryptocurrencies, in particular, has enabled individuals to conduct transactions without the need for intermediaries such as banks or financial institutions. This has made it easier for people to engage in international transactions and has created new opportunities for businesses and investors alike. However, the lack of regulation and potential risks associated with virtual currencies have also raised concerns among governments and financial regulators, leading to efforts to create a regulatory framework for their use. These consist of Amazon Coins, Microsoft Points, and Facebook Credits. In contrast to Bitcoins, which have previously been hinted at, Harvey [8] noted that these coins are issued by businesses and are not connected to any claims on tangible assets. In the event that a major corporation, such as Facebook, does introduce a currency to compete with existing ones, network effects may assure that users of the network adopt the money swiftly.

Harvey said that the early history of illiquidity, high volatility, and potentially ambiguous usage are the key problems with the adoption of cryptocurrencies. Harvey continued by saying that the majority of the problems with the successful adoption of cryptocurrencies are caused by misunderstandings about whether they are virtual or digital currencies, and consequently, how their values are established.

Wagner [9] added that the virtual currencies are often distributed and valued by a centralized authority, which is normally the company that issued them, and are only used to enable online commerce. Because they are used as a medium of trade for tangible goods, cryptocurrencies resemble physical money more closely in terms of form. Ironically, according to Harvey, the majority of the money in use today is digital and hence may be thought of as being in the form of cryptocurrencies.

The question of whether cryptocurrencies should be regarded as currencies or digital assets has also generated strong arguments. According to Glaser et al. [10], while cryptocurrency may appear to function as money, users are primarily interested in it as an investment vehicle, rather than a replacement for traditional currency or a transaction system. This is due to the perceived potential for high returns on investment, as well as the anonymity and decentralization features that cryptocurrencies offer. The authors note that this perspective on cryptocurrency as an investment is reflected in the high volatility of their value and their use as speculative assets.

CONCLUSION

According to the survey conducted, 62% of the respondents find that cryptocurrency is not a preferred mode of payment and would opt for other modes of payment. Furthermore, 50% of the respondents were not aware of the damage caused by cryptocurrency mining on the earth. Also, 55% of the respondents feel that the government should put restrictions on the use of cryptocurrency, whereas

14.5% feel they should completely ban the use of cryptocurrency, and the rest feel the government should not interfere in this matter. And 55% of the respondents will limit the use of cryptocurrency to not harm the environment, whereas 10% will continue without hesitation.

Perceived usefulness is a key factor in determining users' intention to use cryptocurrencies for electronic payments, based on research that specifically focuses on cryptocurrencies and bitcoin. While various studies have investigated the impact of these factors on the adoption of financial technologies or fintech, there is no consensus on how they affect users' intentions to use them. The concept that social influence directly influences this purpose, however, is not supported by the evidence they discover. The theory of planned behavior has been used in various studies to explore the factors that influence individuals' intentions to use cryptocurrencies. In addition to perceived usefulness, subjective norms and perceived behavioral control have also been found to be important factors in determining individuals' intention to use cryptocurrencies. Social influence, or the perceived pressure from others to use cryptocurrencies, can have a significant impact on an individual's intention to use them. Similarly, perceived behavioral control, or the ease of using cryptocurrencies, can also play a critical role in shaping individuals' intentions to use them. Studies on cryptocurrencies, and bitcoin in particular, have come to similar conclusions on how performance expectancy affects usage intention, especially in relation to electronic payments using cryptocurrencies and bitcoin acceptability in China. The most important factor influencing one's intention to utilize bitcoin is perceived usefulness.

It can initially seem odd that perceived danger was not found to be related to their adoption given the current early phases of development of bitcoin financial technologies and their technological foundation (i.e., blockchain).

Cryptocurrencies have a number of advantages, including quick, effective, traceable, and secure transactions, but they also have disadvantages, including inherent risk, technical and financial difficulty in use, and a hazy social image of ownership. The blockchain and cryptocurrency revolution has far-reaching implications that go beyond just the field of finance and technology. It intersects with fields such as economics, law, governance, ethics, and environmental sustainability. A multidisciplinary approach is necessary to understand and address the challenges and opportunities that arise from the adoption of blockchain and cryptocurrency technologies. It also requires collaboration and dialogue between experts from various fields to create policies and regulations that ensure the benefits of these technologies while mitigating their negative impacts. The most popular and significant cryptocurrency in use today, bitcoin, has been the subject of some research, but there is little information on cryptocurrencies in general because this is new to people.

Chaos surrounding cryptocurrencies presents both many opportunities and difficulties. Additionally, cryptocurrencies have faced significant criticism due to their volatile nature. The value of cryptocurrencies can fluctuate drastically in a short period, which can result in substantial financial losses for investors. Moreover, the lack of regulation in the cryptocurrency market makes it prone to fraud and scams. This unregulated market has also made it easier for hackers to target cryptocurrency exchanges and wallets, resulting in significant thefts and losses. Overall, cryptocurrencies have some potential drawbacks that need to be addressed to ensure their continued growth and adoption. Although blockchain is anticipated to have a significant impact on and uses in the majority of economic sectors and activities, cryptocurrencies continue to hold a greater current importance. Cryptocurrencies are not backed by any underlying assets or government, and their value is purely based on supply and demand in the market. The blockchain technology used in cryptocurrencies ensures secure and transparent transactions without the need for intermediaries like banks. However, as mentioned earlier, the lack of regulation and oversight can lead to potential risks and illegal activities.

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