
IMPACT OF CRYPTOCURRENCY ON THE ENVIRONMENT

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ABSTRACT

Money as a medium of exchange determines the financial stature of a nation. With the advent of technological advancements, the idea of Crypto-currency is crystallized. It is secured by multi-layered encryption and decryption techniques wherein the verifiable transactions are stored in blockchain technology. It has widened its base by providing freedom of participation to all individuals without hindering the process with cumbersome documentation. Multiple contentions have been made against crypto-currencies due to the potential threats and challenges it brings along. The least discussed are the serious environmental repercussions due to the usage of excessive energy in the mining process of crypto-currencies which has exacerbated the scenario but has not been addressed. The reason for the environmental aspect taking a backseat is due to other controversial contentions associated which have taken primacy over this due to the involvement of economic value. However, it is pertinent to provide the necessary attention to this issue reiterated in the forthcoming chapters by providing an elaborate understanding of the problem and propagating the ideals of sustainable development. It is important to understand the international stance on the environmental impact of cryptocurrency, especially with respect to the Paris agreement, and what is the position of Indian legislation in this regard. It is also crucial to realize the contribution of private players in combating the hazardous impact of crypto mining and what can be done to tackle the environmental degradation posed by cryptocurrency. Throughout the article, there will be a highlight on the lack of responsiveness to the environmental concerns surrounding the cryptocurrency debt and why is it necessary to monitor and review the status quo at regular intervals by ensuring a mechanism of checks and balances with the help of appropriate initiatives.

1. Analyzing the Environmental Concerns

Cryptocurrencies have been gaining momentum of late; however it becomes imperative to evaluate the risks and costs involved at this stage. Carbon dioxide emissions produced by Bitcoin, a widely known Cryptocurrency, could solely be responsible for elevating global warming by two degrees in a span of three decades.¹ Approximately 25% of the global greenhouse gas phenomenon stems from electricity consumption contributing heavily to global warming.² Bitcoin accounts for 0.4% of the world's electricity consumption and 0.34% of the world's electricity production undermining all the efforts to cut down on energy consumption worldwide.³

Other cryptocurrencies like Ethereum and Litecoin further add onto the consumption rate gradually with their increasing popularity. In the year 2017, cryptocurrencies namely Bitcoin, Ethereum and Bitcoin cash consumed more power than 159 nations alarming environmentalists all across the globe and threatening the Paris climate change agreement.⁴

Every transaction of Bitcoin is recorded in a public ledger spread across various computers all over the globe by means of a blockchain.⁵ The process of creating such virtual currency is referred to as "mining" which is highly energy intensive the primary source of which is fossil fuels. The blockchain network is capable of processing seven transactions per second and with each transaction consuming enough power to run an average household in United States for approximately thirty days.⁶

Heavy computers are required to solve highly complex mathematical problems and equations in order to mine Cryptocurrencies consuming enormous amounts of power. Every four years,

¹ Mora C, Rollins, R.L., Taladay, Kantar, Chock, Franklin, Bitcoin emissions alone could push global warming above 2°C (*Nature Climate Change*, 2018) <<https://www.nature.com/articles/s41558-018-0321-8#citeas>> accessed 28 April 2022.

² Puskar Pande, Study says Bitcoin is an Environment Disaster (*Green Clean Guide*, 30 June 2018) <<https://greencleanguide.com/study-says-bitcoin-is-an-environmental-disaster/#:~:text=Bitcoin%20mining%20is%20an%20energy,a%20result%20of%20electricity%20consumption>> accessed 28 April 2022.

³ Maheen Arshad, Are Cryptocurrencies Harming the Environment? (*Earth.org*, 6 Feb 2020) <<https://earth.org/are-cryptocurrencies-harming-the-environment/>> accessed 29 April 2022.

⁴ Anthony Cuthbertson, Bitcoin Mining on Track to Consume All of the World's Energy by 2020 (*Newsweek*, 4 November 2017) <<https://www.newsweek.com/bitcoin-mining-track-consume-worlds-energy-2020-744036>> accessed 30 April 2022.

⁵ Digiconomist, Bitcoin Energy Consumption Index <<https://digiconomist.net/bitcoin-energy-consumption>> accessed 26 April 2022.

⁶ Ibid.

the quantum of Bitcoins is reduced to half making the cryptocurrency costlier yet more valuable. The proponents argue that digital currencies like cryptocurrency offer an edge over fiat money due to structural delays entailed in fiat money. However, the amount of energy consumed by cryptocurrencies is unprecedented. As per an estimate, the annual energy consumption of Bitcoin hiked from 9.6 terawatt (TWh) in February 2017 to 73.2 TWh in January 2020.⁷

If Bitcoin were a country, it would beat Czech Republic and Colombia in the energy-consumption rankings and sit at rank forty. Another report estimated 69 million metric tons of carbon dioxide being produced by cryptocurrency almost equaling with that produced by the state of Arkansas.⁸ The actual energy consumption rate could be higher than the estimated rates for it does not take into account illegal activity.

A renowned meteorologist by the name of Eric Holthaus once maintained that “*Bitcoin is slowing the effort to achieve a rapid transition away from fossil fuels.*”⁹ It has been suggested that the source of energy is inclusive of but not restricted to Icelandic geothermal power and Chinese coal and hydropower.¹⁰

Most of the cryptocurrency mining that takes place in the rural suburbs of China have huge set ups of rig operations given to the availability of cheap electricity and land.¹¹ China harbors 74% of all the Bitcoin mining and 85% of Bitcoin transactions and trading worldwide. A study by University of Cambridge hint on the exploitation of coal based power plants for electricity used in the mining process.¹²

Additionally, an analogy was placed that the energy consumption by a single Bitcoin mining process in Inner Mongolia equals that of Boeing 747 in operation.¹³ The major source of electricity throughout the world is burning of fossil fuels especially coal which elevates the

⁷ Aria Bendix, Bitcoin trading uses so much power that it could push global temperatures up past a threshold that yields deadly consequences (*Business Inside*, 29 October 2018)

<<https://www.businessinsider.com/bitcoinclimate-carbon-emissions-rising-2018-10>> accessed 4 May 2022.

⁸ *Ibid.*

⁹ Nathan Reiff, „What's the Environmental Impact of Cryptocurrency?“ (*Investopedia*, 9 May 2018)

<<https://www.investopedia.com/tech/whats-environmental-impact-cryptocurrency/>> accessed 30 April 2022.

¹⁰ Christian Stoll, Lena Klaaben, Ulrich Gellersdorfer, „The Carbon Footprint of Bitcoin“ (*Joule*,10)

<[https://www.cell.com/joule/fulltext/S2542-4351\(19\)30255-7](https://www.cell.com/joule/fulltext/S2542-4351(19)30255-7)> accessed 4 May 2022.

¹¹ *Ibid.*

¹² Heidi Samford, „The Political Geography and Environmental Impacts of Cryptocurrency Mining“ (*JSIS*, 2019)

<<https://jsis.washington.edu/people/heidi-samford/>> accessed 3 May 2022.

¹³ *Ibid.*

carbon dioxide content in the environment thereby acting as a key player of climatic degradation. The miners often exploit liberal environment policies risking local communities, safety risks and public health.

A survey of 25,000 mining machines at the mining farm of Mongolia concluded that 8000 to 13000 Kg of carbon dioxide is emitted for each Bitcoin mined; aggregating up to 24,000 to 40,000 kg of carbon dioxide produced every hour.¹⁴ Northern Europe and North America have shown potential to be the next hub for cryptocurrency mining with their permissive laws and conducive environmental factors. Energy consumption of power-hungry computers has surpassed the net power consumption of few nations like Ireland and Austria.¹⁵

Cryptocurrency mining emerged throughout the Mid-Columbia Basin in Washington constituting Douglas, Chelan and Grant counties around 2012.¹⁶ The said regions are rich in hydroelectricity produced by dams on the Columbia River, and various other fuels like natural gas, coal and nuclear energy which attracted the miners. Given to the vast energy production and low cost of land, technology companies and developers were attracted to capitalize on export of surplus energy. However, surplus energy exports drastically decreased and the cost of residential electricity substantially increased with the large energy consumption of cryptocurrency mines in these areas. The situation also led to a surge of unauthorized miners functioning from local neighborhoods in addition to the companies. The lack of regulations and governing body in cryptocurrency domain poses grave risk to public health, safety and a region's energy infrastructure as was depicted in the situation of Columbia River belt. It is high time for the governments worldwide to intervene and device infrastructure to curb the menace created by carbon footprints of cryptocurrency.

Cryptocurrency lacks regulatory body and centralized system leading to mushroom growth of miners competing to sustain in the market and create monopoly. In order to avert inflation and deter monopolies, the complexity of algorithms increases with the rise in competitive market. In order to sustain, the servers require additional machinery and energy thereby creating the

¹⁴ Johnathon Bright, The Environmental Impact of Bitcoin Mining Energy Consumption, (*Coin Rivet*, 14) <<https://coinrivet.com/theenvironmental-impact-of-bitcoin-mining-energy-consumption/> > accessed 4 May 2022.

¹⁵ Heidi Samford, The Political Geography and Environmental Impacts of Cryptocurrency Mining (*JSIS*, 2019) < <https://jsis.washington.edu/people/heidi-samford/>> accessed 3 May 2022

¹⁶ Roberts, Paul, This Is What Happens When Bitcoin Miners Take over Your Town (*Politico Magazine*, March 2018) <<https://www.politico.com/magazine/story/2018/03/09/bitcoin-mining-energy-prices-smalltownfeature-217230>> accessed 5 May 2022.

demand for more powerful computing systems with faster internet connection at cheaper cost. Cheaper the infrastructural cost of electricity and supplementary requirements more would be the profit margin from cryptocurrency mining.

Tesla's investment of \$1.5 billion on bitcoins has raised several questions about their integrity.¹⁷ Not only did the purchase surge the prices of cryptocurrency but also sparked an environment debate on Elon Musk's climate change priorities.

2. International Perspective

The introduction of crypto-currency has created a huge uproar for the features that it entails. It has successfully initiated the discourse ranging from privacy concerns to volatility issues, and many more. The environmental concern seems to be the least discussed arena while pondering over the concept of crypto-currency. The earlier chapter has elaborately discussed the magnitude of the problem. It becomes pertinent to note that the environmental discussion has not been much prevalent over the issue due to the quantitative value it seeks to offer. Regardless, it is important to consider and uphold the agenda of sustainable development which began with the Stockholm Conference in the year 1972¹⁸ which made the world acknowledge that the rise or development in economic terms has led to a reduction in the natural capital of the planet.

In addition to this, it also highlighted that such exclusive development which ignores the environmental aspects not only creates an imbalance in the ecology but also gives a necessary push towards the direction of complete degradation of the planet. This gave birth to the idea of sustainable development wherein the needs of the existing generation are taken into consideration but not at the cost of the future generation.¹⁹ The same has been reiterated by the Earth Summit 1992²⁰, the United Nations Conference on Sustainable Development 2012²¹ and

¹⁷ Roberts, Paul, This Is What Happens When Bitcoin Miners Take Over Your Town (*Politico Magazine*, March 2018)

<<https://www.politico.com/magazine/story/2018/03/09/bitcoin-mining-energy-prices-smalltownfeature-217230>> accessed 5 May 2022.

¹⁸ UN General Assembly, United Nations Conference on the Human Environment (15-12-1972, A/RES/2994) <<http://www.refworld.org/docid/3b00f1c840.html>> Accessed 24 April 2022.

¹⁹ Ibid.

²⁰ 1992 Rio Declaration on Environment and Development (14-6-1992 A/CONF/151/26) <<https://www.un.org/en/conferences/environment/rio1992>> Accessed 24 April 2022

²¹ United Nations Conference on Sustainable Development, Rio+20 (22-6-2012 A/CONF/216/5) <<https://www.un.org/en/conferences/environment/rio2012>> Accessed 24 April 2022.

many more.

The discourse of environmental protection in the instantaneous scenario has to be undertaken as a global community as happened at earlier instances for the climatic disruption it creates through global warming and emissions. This issue of climate change was undertaken as a matter of significant importance when a total of 196 nations came together to adopt a binding international treaty on climate termed as the Paris Agreement in 2015.²² The aforementioned landmark treaty focuses on reduction of global warming as well as a decrease of emissions. It provides for a limit of global warming to 2 degree Celsius with the desirable goal of 1.5 degree Celsius.²³ However, it has been provided by a multiple studies such as Nature Climate Change that if the energy consumption of a popular crypto-currency named Bitcoin increases with the existing rates then the emissions from the process of mining shall lead to increase of global warming above 2 degree Celsius by 2033.²⁴ Therefore, if the adoption of such currency is undertaken at the rate of acceptance of other technologies then it shall lead to catastrophic hazards.

Taking into consideration all this, it can be validly contested that this is not only hindering the successful enforcement of Paris agreement but is in its direct violation along with other international treaties striving to achieve the object concerning climate change. It is only because of this international agreement that emission trading systems are being proposed by different nations to contribute to achieve the desired goal. China has announced for the establishment of a mechanism to reduce emission and the same has been considered for linkage by Korea along with Japan. Similar emission trading framework collaboration is being undertaken by California, Quebec (Canada), European Union, Japan with a network of 17 nations including Vietnam.²⁵

Such arrangements lead to allocation of emissions rights based on a carbon dioxide equivalent to other nations or businesses making them responsible for reducing emissions in the concerned state. However, these trading systems more face the challenge of having a transparent

²² Paris Agreement to the United Nations Framework Convention on Climate Change(12-12-2015, T.I.A.S. No. 16-1104)

<<https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>>Accessed 4 May 2022.

²³ Ibid.

²⁴ Refer note 7.

²⁵ Seong-Kyu Kim, Jun-Ho Huh, Blockchain of Carbon Trading for UN Sustainable Development Goals (2020) 12 (10) MDPI

<<https://www.mdpi.com/2071-1050/12/10/4021>> accessed 4 May 2022.

mechanism to avoid double counting of emissions. Nonetheless, it can prove to be beneficial at the instance of crypto-currency as for the reason of it having a clear functioning as it is traded through a central source around the world.

Even though there has been such huge acceptance and approval of crypto-currency amongst different nations but the lesser has been their concern to formulate any regulation or policies with regards to its energy consumption or carbon emissions. Countries like Switzerland, Germany, Australia, South Korea, France, Singapore and many more have opted for a crypto-friendly regulatory approach²⁶ to allow its trading but have failed to address the environmental concern. China has not allowed it roll as fiat money but has provided a nod as a virtual property. It has been declared by China that they shall release their digital currency through central banks.²⁷ However, it is one of those few nations taking into consideration the need to mitigate the implications of crypto by subsidizing the miners to incentivize them in exchange of their usage of local hydropower sources in the process. The same has been undertaken by Norway.

Further, there are certain nations with existing policies on carbon taxation which is understood to tackle with the threat posed by the crypto-mining but not any specialized policies for the whole concept. It has been argued by some that carbon taxation would have limited effectiveness while dealing the environmental impact of crypto-currency.²⁸ Some of the academicians have proposed “Bitcoin Blockchain Carbon Emission (BBCE) Model”³³ wherein the situation of China has been assessed to highlight the need of policy interventions at operational level to deal with the issue. In pursuance to the same, the private players are providing their contribution in resolving the problem by introducing community driven initiatives like Crypto Climate Accord inspired by the Paris Agreement to reduce the Carbon footprint of Crypto-currency.²⁹

²⁶ Ikigai Law, Global Cryptocurrency Regulatory Landscape (*Mondaq*, 9 March) <<https://www.mondaq.com/india/fin-tech/1044546/global-cryptocurrency-regulatory-landscape>> Accessed 4 May 2022.

²⁷ Deepshikha Sikarwar, With a law, India plans lasting ban on cryptos(*Economic Times*, 12 June 2020) <<https://economictimes.indiatimes.com/news/economy/policy/with-a-law-india-plans-lasting-ban-on-cryptos/articleshow/76330403.cms>> accessed 4 May 2022.

²⁸ Shangrong Jiang, Yuze Li, Quanying Lu, Yongmiao Hong, Dabo Guan, Yu Xiong, Shouyang Wang, Policy Assessments for the Carbon Emission Flows and Sustainability of Bitcoin Blockchain Operation in China (*Researchgate*, August)

<https://www.researchgate.net/publication/345184652_Policy_Assessments_for_the_Carbon_Emission_Flows_and_Sustainability_of_Bitcoin_Blockchain_Operation_in_China> accessed 5 May 2022

²⁹ Ibid.

Thus, it can be stated that discourse of mitigation has begun but it needs more attention and participation from different nations or players to become a mainstream concern of all. Even though the emerging technologies change the dynamics of transacting but the environmental ideals must not be ignored for sustainability in the longer run.

3. Indian Scenario

Different nations have opted for varied strategies to deal with the acceptance of digital currencies. Countries like Bolivia, Indonesia have opted for total abolition³⁰ while others like China have declared it as a virtual property but have rejected it as a form of fiat money. Japan and New York have also allowed crypto-currency transactions but through a structured and regulated framework to reduce the risks associated with this arrangement.

As far as India is concerned, it has been in a precarious situation when it comes to digital currency since a long time. Various governmental actions and court interventions have resulted in a policy vacuum and till date, India's official position on the digital currency is questionable. At present, digital currencies are not considered as legal tender. However, despite these regulatory and legal standstills, the use of crypto-currency in India has slowly gathered momentum in recent times. Even though the Reserve Bank of India through its powers under the Reserve Bank of India Act, 1934³¹ and Payment and Settlement Systems Act, 2007³² banned all dealings relating to crypto-currencies but the same was overturned by the Supreme Court in its judgment *Internet and Mobile Association of India v. Reserve Bank of India*³³ wherein it overruled the ban. At present, the country remains without any clarity on the position of virtual currencies.

The Inter-Ministerial Committee, constituted in 2017, had submitted its Report in 2019³⁴ recommending the ban of crypto-currencies in India and also submitted a Draft Bill, "Banning of Crypto-currency & Regulation of Official Digital Currency Bill, 2019". The Bill essentially prescribed that crypto-currencies cannot be used as a legal tender in India. And proposed a

³⁰ Draft Banning of Cryptocurrency & Regulation of Official Digital Currency Bill 2019 (PRS, 2019) <<https://www.prsindia.org/billtrack/draft-banning-cryptocurrency-regulation-official-digital-currency-bill2019>> accessed 4 May 2022.

³¹ The Reserve Bank of India Act, 1934.

³² The Payment and Settlement Systems Act, 2007.

³³ *Internet and Mobile Associations of India v Reserve Bank of India* [Writ Petition (Civ.) No. 528/2018].

³⁴ Report of the Committee to propose specific actions to be taken in relation to Virtual Currencies (2019) <<https://dea.gov.in/sites/default/files/Approved%20and%20Signed%20Report%20and%20Bill%20of%20IMC%20on%20VCs%2028%20Feb%202019.pdf>> accessed 5 May 2022.

blanket prohibition on any transaction related to digital assets and not only digital currencies. The bill has been now reintroduced under the name of “Crypto-currency and Regulation of Official Digital Currency Bill, 2021” with certain modifications wherein there exists a prohibition on private crypto-currencies but a nod to government or RBI regulated digital currency in India.³⁵ However, what entails under private crypto-currency remains ambiguous along with whether this falls under the category of currency or stock. In furtherance to the same, there exists a suspending question that if the bill is passed and the government decides to roll out crypto-currency then how do we tackle the environmental issue to uphold the sustainable development goals which was established in India through various judicial pronouncements such as the *Vellore Citizen’s Welfare Forum v Union of India and Ors*³⁶.

In another case, *Rural Litigation and Entitlement Kendra v State of Uttar Pradesh*³⁷ the importance of environmental protection along with ecological balance was emphasized over economic growth. Therefore, it can be understood that the nation considers the environmental protection as its primary concerns but fails to provide for a dedicated answer in terms of crypto-currency. Even though section 2(a)³⁸ of the Environmental Protection Act, 1986 provides for an inclusive definition with it being umbrella legislation but even then if it is accompanied with other major acts would not suffice in responding to the concerns raised by the digital currency.

Therefore, if the bill receives a nod then we must prepare for a robust framework to address and provide for an elaborate strategy at all levels of operation to deal with issues such as site selection for the purposes of mining, the accessibility of miners, the energy consumption structure, emission response management and many more. If the policy so formulated takes into consideration the aforementioned aspects, then it shall not only be exhaustive and effective in terms of functioning of crypto-currency but shall also tackle the environmental affair in the most optimal way thereby upholding the objectives of the Paris Agreement. In addition to this, India can also focus on promotion of international integration mechanisms such as the emission trading systems, climate accord etc thereby making the process more efficient and effective along with a reduction in costs through a collaborative effort of all. This shall allow the nation

³⁵ Tanuj Hazari, Cryptocurrency And Regulation Of Official Digital Currency Bill, 2021 And Legal Framework Ahead (*Livelaw*, 6 February 2021)

<<https://www.livelaw.in/columns/parliament-cryptocurrency-digitalcurrency-crypto-bill-rbi-sebi-169508?infinitemscroll=1>>Accessed 1 May 2022.

³⁶ [1996] 5 SCC 647.

³⁷ [1985] AIR 652.

³⁸ § 2(a), Environment Protection Act 1986.

to strengthen its developmental goals by acknowledging the economic, social and environmental sustainability at a global level.

4. Conclusion

One might find ourselves so immersed in the utility of a new concept that we tend to turn a blind eye towards its shortcomings; so is the case of cryptocurrency. The authors throughout the course of the paper attempt to highlight the lack of responsiveness to the environmental concerns surrounding the cryptocurrency debate. The dire need to inhibit the rising threat to the environment is felt at a global level.

One of the most efficient ways to achieve that is by having a binding International multilateral treaty in place. Such International Regulation or Intervention would make the global community responsive and accountable as created by this global medium of exchange. At the national level, regulations in the form of carbon tax and BitLicense would be a viable option.

Carbon Tax at multiple instances has been proved to instill limited effectiveness but in the instant case it shall depend on the scale of operations of the nation. The countries wherein carbon taxation leads to effective results can adopt the same while the others can take a step further to bring direct taxation policies on mining in place.

In addition to this, the states are required to implement policy interventions at all levels of operation to address the issue in the most optimal way. Further, BitLicense as implemented in New York would help regulate cryptocurrency in the State and keep an eye on the mining activities. The same can be followed by other nations to monitor the environmental impact thereby curbing its affect.

Moreover, the trading of carbon emission is another collective step that must be promoted to help countries regulate their emission rates and reduce global warming. This can be done by linking the various emission trading markets in order to foster a collaborative and assisted growth of all.

A step further can be taken by providing recognition accompanied with endorsement to various self governance models and initiatives by private players such as the Crypto Climate Accord to facilitate a check on environmental impact of cryptocurrency. This shall allow the private sector to contribute to the decarbonizations process of the virtual currency catalyzing the pace

to tackle the situation. While, a shift to renewable resources would reduce the environmental impact of cryptocurrency however, a complete departure from non-renewable resources cannot be guaranteed.

It is thus necessary to monitor and review the status quo at regular intervals by ensuring a mechanism of check and balances with the help of appropriate initiatives. Such measures become significant to be acted upon at this juncture for the reason that there exists no qualitative development at the cost of the environment.