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# Cryptocurrencies and ESG: a contradiction in terms?

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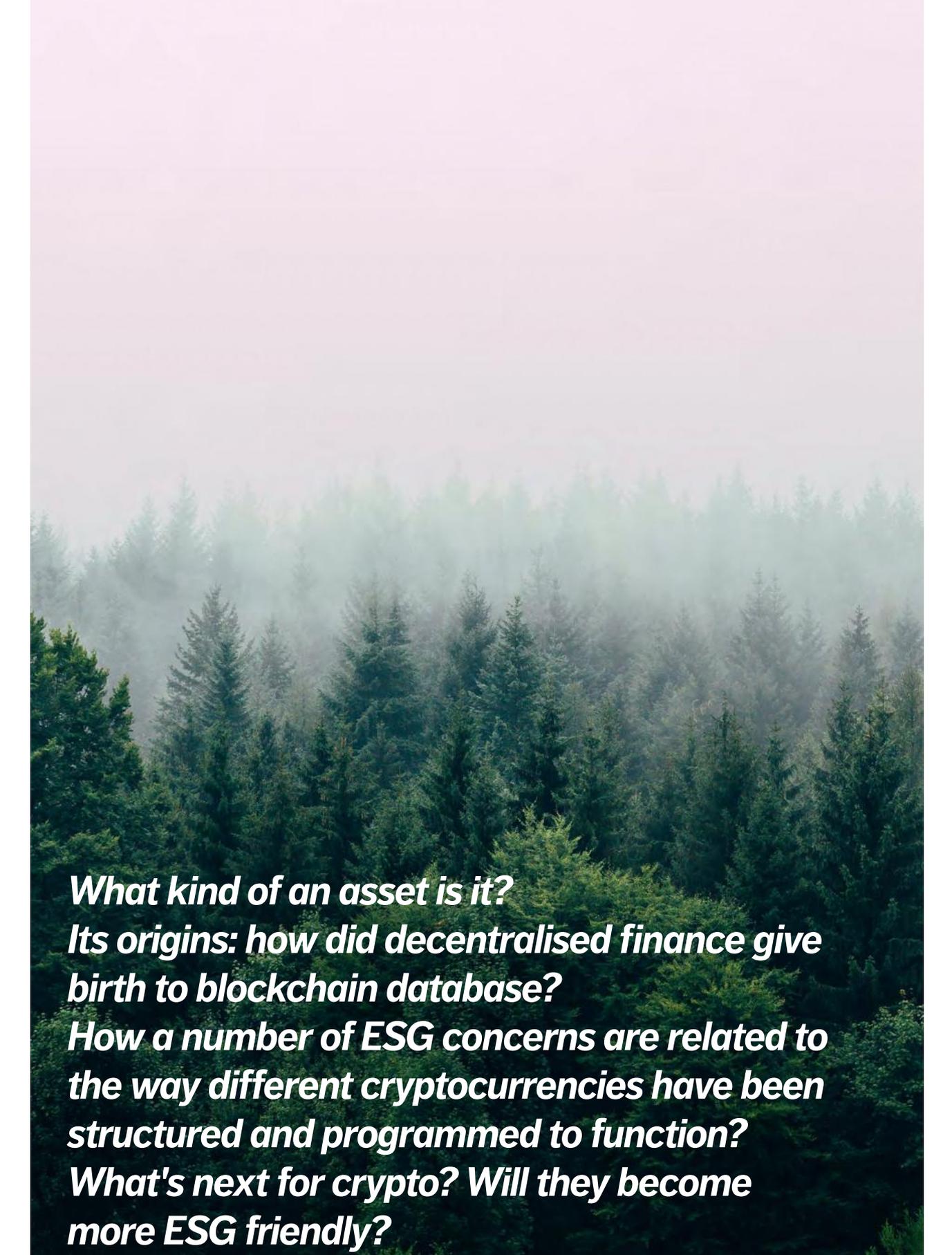
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***What kind of an asset is it?  
Its origins: how did decentralised finance give birth to blockchain database?  
How a number of ESG concerns are related to the way different cryptocurrencies have been structured and programmed to function?  
What's next for crypto? Will they become more ESG friendly?***

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# Cryptocurrencies and ESG: a contradiction in terms?

***Cryptocurrency is a digital asset in which transactions are verified and recorded using a decentralised system, rather than by a centralised authority, such as banks.***

*The COVID-19 pandemic has accelerated several market trends, not least the use of cryptocurrencies (or “crypto” for short) and the incorporation of Environmental, Social and Governance (ESG) factors by investors. Mainstream financial institutions’ growing acceptance of cryptocurrencies as an investable and tradable asset class has certainly played a part.*

*Cryptocurrencies have also benefited from the interest of “Millennials”, younger, first-time investors. According to market estimates, there are about 5,400 different cryptocurrencies in existence<sup>1</sup> but it is the largest, Bitcoin and Ethereum, that are attempting to enter the mainstream markets, backed by the combined market value of about USD1trillion<sup>2</sup>. A single bitcoin has seen its price rise from about USD7,000 a year ago to hit a record high of almost USD65,000 on 14 April 2021.*

*The first year of the global COVID-19 crisis had also proved very significant for investors’ adoption of Environmental, Social and Governance (ESG) principles. We believe that it is partly due to younger generations of investors, who regard social and ethical investment options as notably more important than their Baby Boomer predecessors. So while both ESG investments and a fascination with bitcoin have been exacerbated by the pandemic, there is an increased*

*interest in whether investing in cryptocurrencies meets the strict criteria related to their impact on the environment, companies’ governance standards, as well as the society at large.*

*In this paper, we will outline Candriam’s view on whether cryptocurrencies are compatible with ESG. We will not be addressing niche types of crypto such as Stable coins and what used to be known as Libra - Facebook, now known as Diem. We will start with the recently well-publicised concerns about Bitcoin’s energy consumption, and then delve into other ESG concerns and their origins. We will look at what kind of an asset class crypto is, and how it originated in the concept of de-centralised finance, which in turn gave birth to blockchain database. We will then explain how blockchain works as the engine of cryptocurrencies, and look at how a number of ESG concerns are related to the way different cryptocurrencies have been structured and programmed to function. We will conclude outlining some of the key ongoing and future developments in crypto and whether they may pave a way to a more ESG-compliant crypto asset class.*

# Cryptocurrencies’ ESG risks in the news

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Perhaps the biggest running news story involving a crypto giant Bitcoin concerned a USD 1.5 billion investment in the cryptocurrency by Tesla, which was disclosed on 8 February 2021. However, on 13 May Tesla’s CEO Elon Musk tweeted that the company will stop to accept Bitcoin due to concerns over “increasing use of fossil fuels for Bitcoin mining and transactions”.

According to a study of the University of Cambridge, bitcoin mining (i.e. the process of creating) uses about 0.4% of global energy consumption. The University of Cambridge Bitcoin Electricity Consumption Index ranked bitcoin’s annual electricity consumption above that of Argentina and the Netherlands. To make things worse, over a half of the Bitcoin mining occurs in China, where coal remains a very significant source of electricity production. We will talk about it in more detail in the chapter on mining (page 10).

There is also a consistent stream of stories related to the use of cryptocurrencies for money laundering, terrorism financing and fraud<sup>3</sup>.

**“According to a study of the University of Cambridge, bitcoin mining uses about 0.4% of global energy consumption.”**

# An asset class like no other

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The rise in Bitcoin's price has understandably highlighted cryptocurrencies as a potential investment which is easy to access. However, as there seems to be no clear definition of what type of asset cryptocurrencies are, we are reminded of Warren Buffet's famous caution: "*do not invest in anything you cannot understand*".

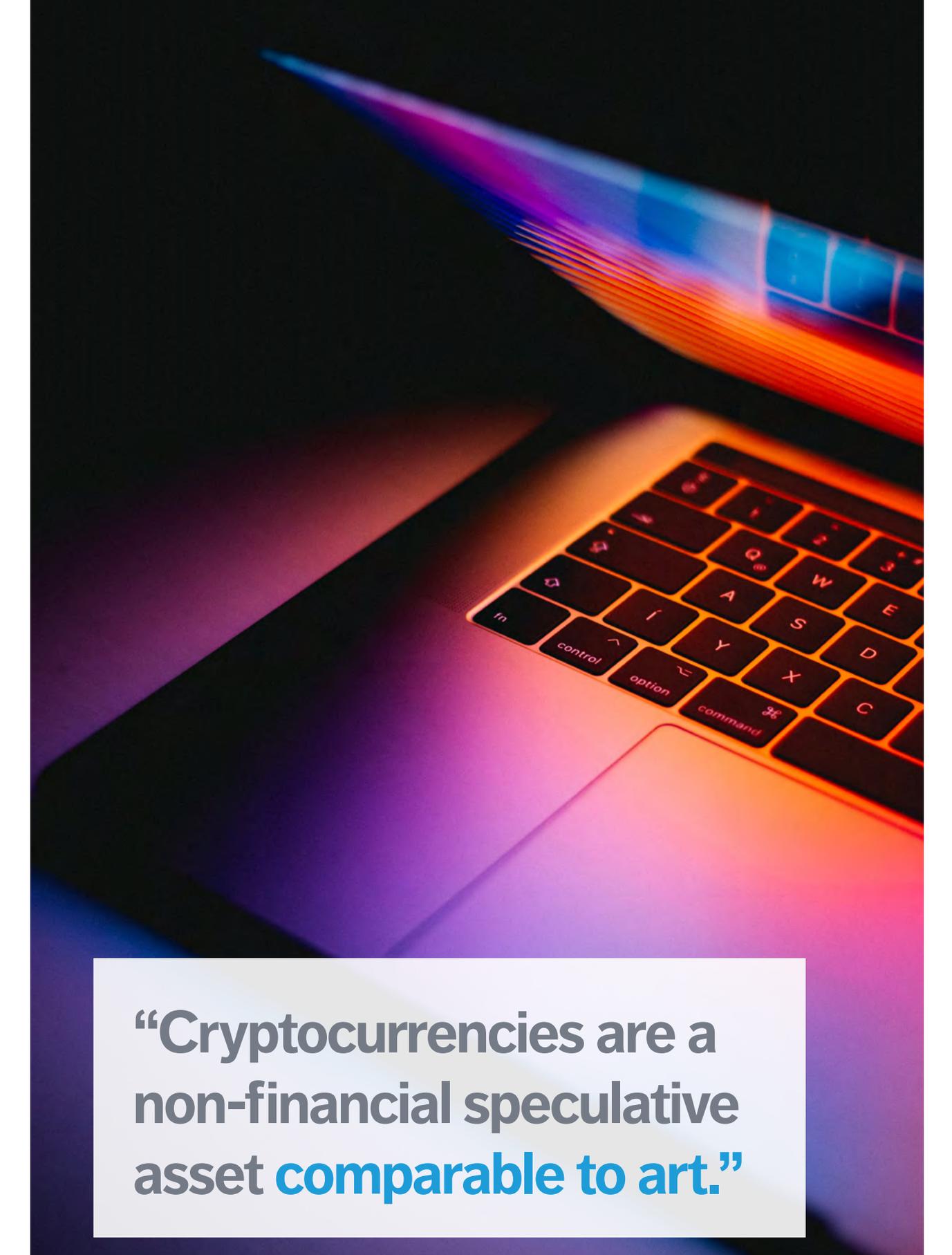
Unlike real currencies, cryptocurrencies do not function as stores of value and they do not derive their value from being "legal tender", governments' acceptable form of payment. Unlike bonds, they do

not pay coupon and unlike equities they do not pay dividends and do not represent a material asset, such as company ownership. Cryptocurrencies are a non-financial speculative asset comparable to art<sup>4</sup>. The value of contemporary art is not objective or intrinsic, it is not based on fundamentals, such as corporate profitability or capital. Cryptocurrencies are unregulated and can be traded for profit, and can also become a target of speculators, who at times sent the prices skyrocketing.

## ESG Concern 1

### Unregulated Exchanges: money laundering and shadow banking

*This concern is related to criminals using cryptocurrencies as their tool to launder their ill-gotten money and conduct banking operations under the radar of regulated banking systems. This can include the vast amounts of money stolen by corrupt regimes from their people, as well as illegal off-balance sheet transactions, enabling double accounting and shadow banking for terrorists. CipherTrace's 2020 Cryptocurrency Crime and Anti-Money Laundering Report<sup>5</sup> reveals that in 2020, major crypto thefts, hacks, and frauds totalled USD1.9 billion. However, these estimates are likely to represent a small proportion of what is actually being laundered through cryptocurrencies. This is because the biggest, most sophisticated criminals do not use criminally-linked addresses to launder their funds and so are difficult to identify<sup>6</sup>.*



“Cryptocurrencies are a non-financial speculative asset **comparable to art.**”

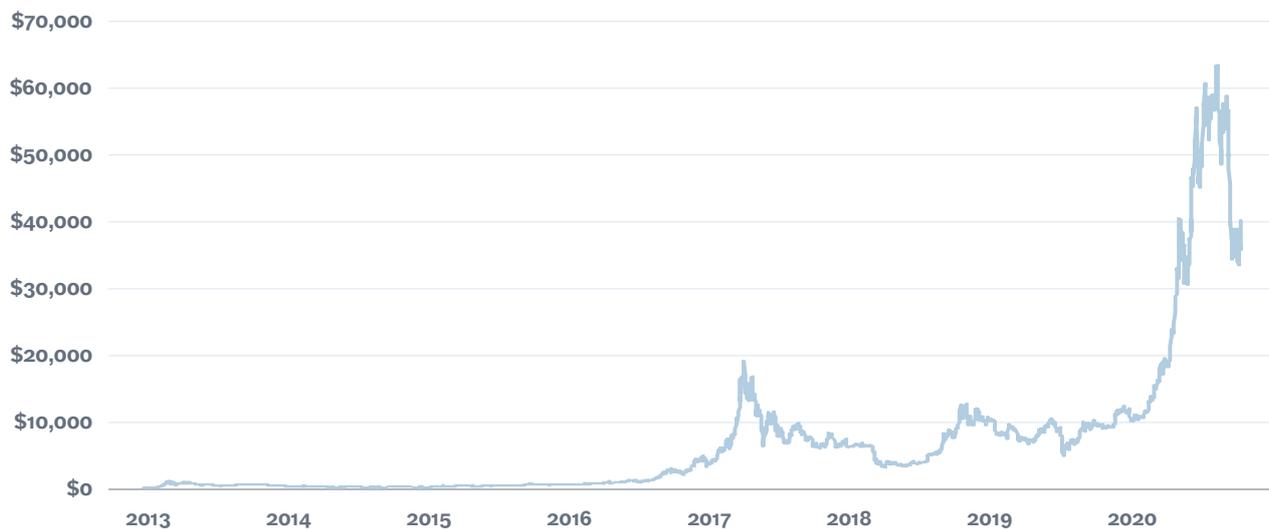
For example, over 2020, the price of Bitcoin has increased by over 300%. This is because the price of cryptocurrencies with limited supply, like Bitcoin, can rise quickly when demand becomes more widespread. But it also means that the price can fall as sharply.

In fact, the biggest fluctuation in Bitcoin's history took place over the past 12 months at the time of writing (June 2021). The price of Bitcoin exceeded USD 60,000 before falling back (to USD 35,516 on 07.06.2021).

First, on 8 February 2021, Tesla disclosed that it acquired USD 1.5 billion worth of Bitcoin. The company said it was trying to maximise returns on cash that is not being used in day-to-day running of the company. It also stated that it expected to start accepting Bitcoin as payment in future. Once the price of Bitcoin rose following the announcement. Tesla then sold 10% of its Bitcoin holdings, which helped the company to generate profits in the first quarter<sup>7</sup>.

### Figure 1: The recent Bitcoin rollercoaster

10/01/2013 to 06/07/2021



Source: Coindesk

China was a major factor as the Bitcoin price took a corrective dive down after Musk's U-turn in April. First, an electricity blackout in China's Xinjiang region led to a decline in the Bitcoin hash rate – which measures the processing power of the Bitcoin network – and apparently it spooked investors into selling their Bitcoin holdings. And at the end of May 2021, after weeks of rumors, the Chinese government has banned financial institutions and payment companies from providing services related to cryptocurrency transactions, and warned investors against speculative crypto trading<sup>9</sup>. China is also gradually stopping bitcoin mining in its regions, with key mining companies starting to pull out of China<sup>10</sup>. One of the key problems is that cryptocurrencies are not domiciled in a particular country, which complicates policy and regulatory alignment, a requirement which is needed not only for the credibility and reliability of cryptocurrencies but also to avoid holding back their development.

Cryptocurrencies have a very few metrics available that allow for forecasting, which makes it even more difficult. As we have seen with Tesla's influence on Bitcoin's price, often only relatively few cryptocurrency holders own a large portion of available supply. These large holders – referred to as “whales” – are said to make up of two percent of anonymous ownership accounts, whilst owning roughly 92% of Bitcoin. In addition, most people who use cryptocurrency-related services worldwide are retail clients rather than institutional investors and, as most asset managers well know, the investment behavior of retail investors is far more difficult to predict.

## ESG Concern 2

### Social Inclusion... or risk of loss of capital laundering and shadow banking

*Some stated that cryptocurrencies bring clear social benefits, the main of which is financial inclusion<sup>8</sup>. The argument went that anyone with an internet connection can have access to a payment and investment system, particularly for people in Africa and countries like India, where access to banking services for some is difficult. Although this is a laudable ambition in theory, in reality it is actually different. First, the requirement to pay for a smart phone and an internet connection does nothing to help the world's poorest inhabitants. And lastly, even those that can afford to access cryptocurrencies will face high costs of converting their digital coins into real-world money to buy goods and services, and crypto's price volatility presents clear risk of diminishing their capital.*

The substantial price inflation that many other cryptocurrencies apart from Bitcoin had experienced, have also coincided with bouts of extreme volatility. Periods of daily price changes in the range of 20% to 40% have regularly occurred in the past. These bubble-like characteristics can produce sizable rewards for those who wish to benefit from hypes and for market speculators.

Being so volatile raises the question of the viability as a currency. National currencies like US Dollars or Euros are considerably more stable. Even if we look at emerging market currencies that sometimes go through periods of instability, they rarely exhibited such a high degree of volatility. National currencies have an inherent advantage of having government backing, which creates a level of confidence among users.

In addition to extreme volatility, there are seem to be inconsistencies in how cryptocurrencies are categorised from the asset class perspective. The U.S. Commodity Futures Trading commission (CFTC) treats Bitcoin as a commodity while the U.S. Internal Revenue Service or IRS classifies bitcoin as property. Also, the International Financial Reporting Standards or IFRS is unclear on the treatment of cryptocurrencies as they do not meet the definition of a financial asset<sup>11</sup>.

So where does this unusual “asset class like no other”, which attracts so much attention from investors and regulators alike, come from?

**“One of the key problems is that cryptocurrencies are not domiciled in a particularly country which complicates policy and regulatory alignment.”**





# The origins of crypto: decentralised finance

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Decentralised Finance (DeFi) gained prominence in the last decade as a movement that focused on eradicating any human involvement from financial services by creating an open-source, permissionless, and transparent financial service. Such system, they argued, would have no need of a central intermediary to hold funds. Instead, all financial transactions would take place directly between participants through automated processes. Teams of programmers who worked on the idea of decentralised finance have eventually come up with an engine that would bring it to life: blockchain.

## ESG Concern 3

### Anonymity: a cover for scams, cyber-attacks and crypto fraud

*The anonymity afforded by the crypto market enabled crooks to engineer ingenious scams through fictitious coins and ICOs (Initial Coin Offerings): unregulated processes by which funds are raised for a new cryptocurrency.*

*One of the most well-known crypto scams was OneCoin, promoted by Dr Ruja Ignatova, the so-called “Cryptoqueen”. In high-profile presentations in front of thousand-strong audiences, she announced that she invented a cryptocurrency to rival Bitcoin. After collecting billions in investments, she disappeared in 2017, with the money and without a trace<sup>12</sup>.*

*In a more recent example, in June 2021, the US Justice Department said it seized approximately USD2.3 million in Bitcoins paid in ransom to hackers whose attack prompted the shutdown of the key East Coast pipeline<sup>13</sup>.*

*Decentralised finance (DeFi) is the next major threat vector for fraud: half of all thefts in 2020, totalling USD129 million, were DeFi-related hacks. This threat looks to increase over the next few years as some centralised exchanges, such as Shapeshift, are transforming into decentralised exchanges (DEXs) to avoid compliance under the Know Your Customer (KYC) rules.*

*Given the ease of cross-border transfers, growth in cryptocurrencies related cybercrime highlights the urgent need for policy intervention, but more importantly international regulatory alignment.*

**“Decentralised finance:  
all financial transactions take  
place directly **between participants**  
through **automated processes.**”**

# Blockchain: a complex engine of cryptocurrencies

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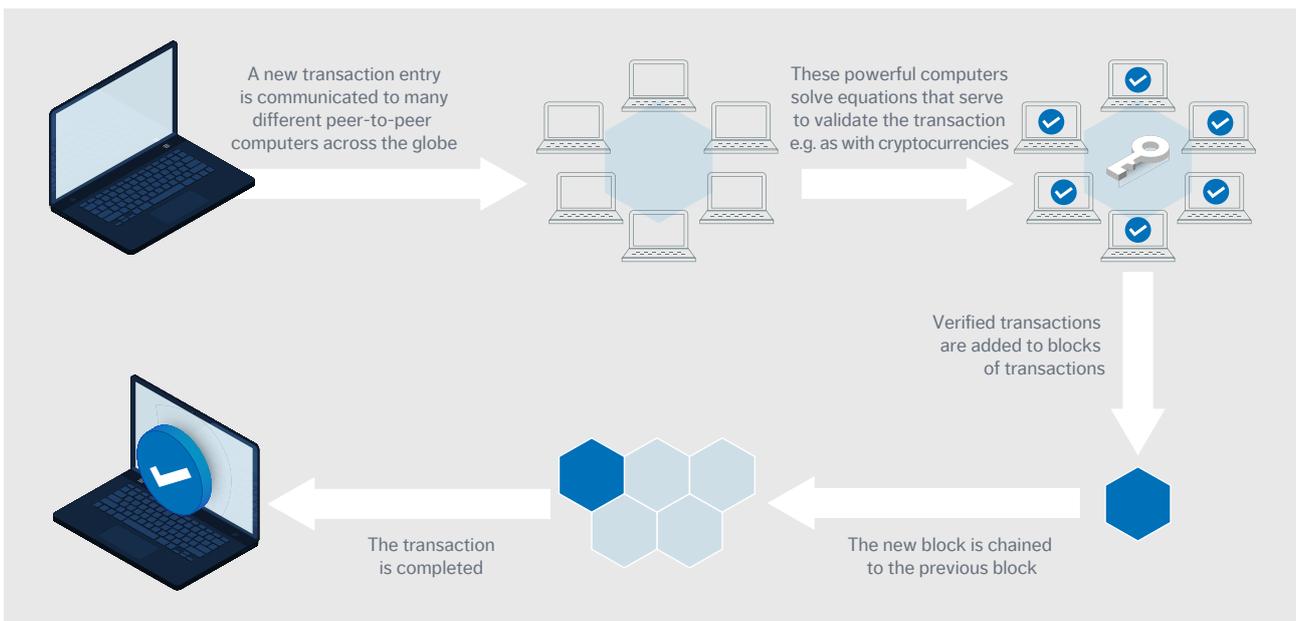
Blockchain is a specific type of database, and it differs from a typical database in the way it stores information. The term “Blockchain” is derived from the way this database is built: it forms blocks of submitted records which are then added to old blocks. Every block has a certain size. When it is filled to capacity, it is chained, forming a chain of data known as the “blockchain.”

Blockchain databases are used in many other areas apart from crypto, such as secure sharing of medical data, musical royalty tracking and personal identity mechanisms.

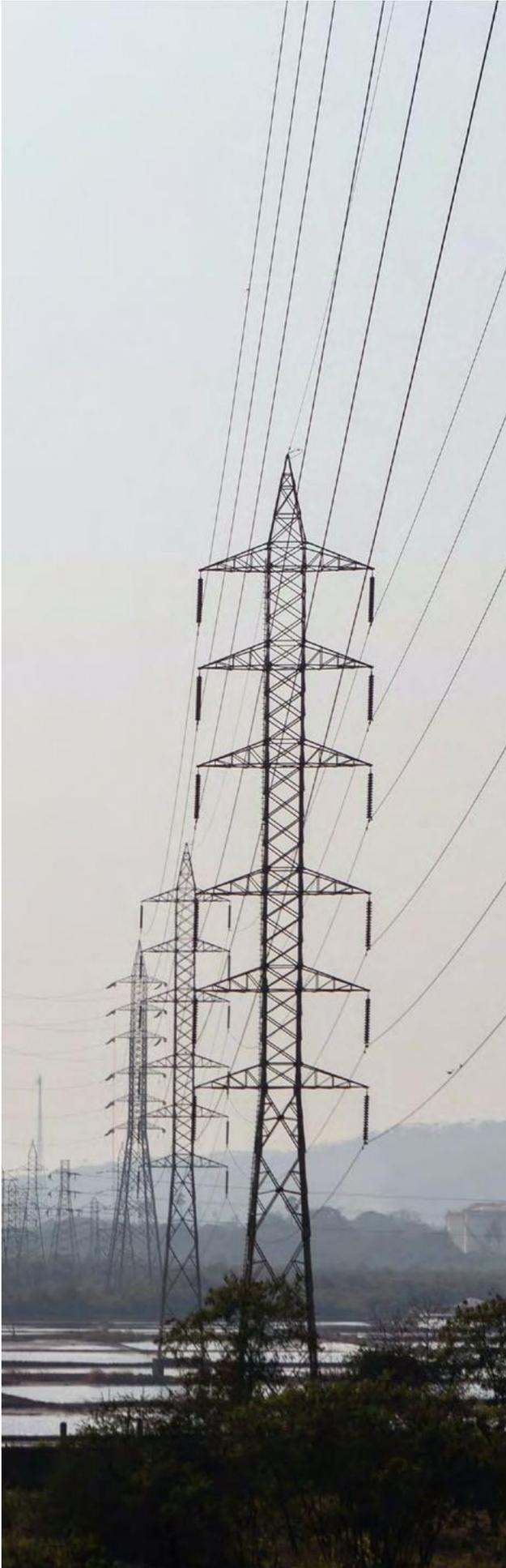
When it comes to cryptocurrencies, which only exist in dematerialised form, blockchain is used as a way of keeping transaction records. This technology is used to enable records of transactions to be verified by Bitcoin participants themselves as, in contrast to a regulated national currencies and banking system, the responsibility for the safety of the deposits is not with Bitcoin by law. Blockchain is used in a decentralised way so that no single person or group has control—rather, all users collectively retain control. Once data is entered in a decentralised blockchain, it cannot be changed. Blockchain keeps all the records of transactions permanently so they can be viewed by anyone, although the identity of traders remains concealed.

Blockchain is used as a ledger for transactions based on distributed ledger technology (DLT), a digital system for recording transaction of assets in a decentralised way. Distributed networks can protect against manipulation of records without a central authority. This process uses peer-to-peer (P2P)<sup>14</sup> networks and is encrypted. Central banks are expected to adopt this technology in three to five years' time.

**Figure 2: The blockchain process for cryptocurrencies**



Source: Candriam



# Important question of supply: limited or not limited?

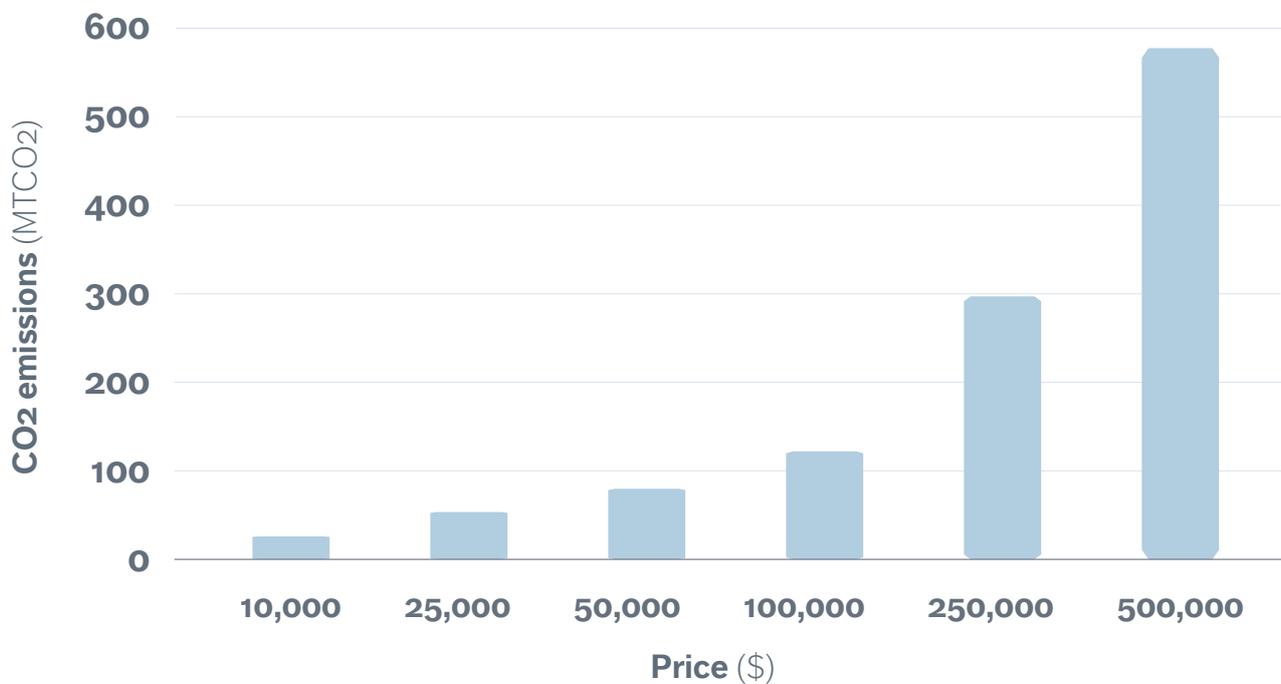
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A few cryptocurrencies have a clear limit of how many coins they are able to issue. The closer it gets to that ceiling the more expensive they become. Bitcoin is in that category – it has a maximum supply limit embedded in their design. It can issue the maximum of 21,000,000 coins but no more. As of April 2021, Bitcoin issued 89% of all the coins it can issue.

New coins are created through a process called mining, an important part of the functioning of the blockchain ledger. To help ensure the integrity of issuance of new units and to prevent participants fraudulently edit the global record of all transactions, Bitcoin uses a system of puzzles. These complicated puzzles are solved in the process of mining by using powerful computers, which validate new blockchain blocks created in the process of mining. This type of validation of data blocks is called “proof-of-work”. Since ‘miners’ are rewarded with some bitcoin when solving the complex algorithm, the higher the bitcoin price, the higher incentive to run the calculations, which consumes more energy (see Figure 3).

Mining bitcoin requires specialised ASIC (application-specific integrated circuit) chips and massive servers, which can rack up expensive electrical bills. This means electricity costs come into play, which is a big reason why China, where electricity is cheap, is home to four out of five of the world's largest bitcoin mining farms (computer networks for the use of large numbers of miners).

**Figure 3: Bitcoin price scenarios and estimated CO<sub>2</sub> emissions**



Sources: CBECI, BofA Global Research estimates

## ESG Concern 4

### Mined cryptocurrencies: designed to be super energy intensive

*The concern raised by Musk, which we mentioned earlier in this paper, related to Bitcoin's energy consumption. It is one of the key ESG objections for responsible investors. The origin of this problem lies in Bitcoin's design – the security and integrity of its blockchain is protected largely by extremely complex puzzles. The Bitcoin programme is written in such a way that the closer it gets to the magic 21 million limit of Bitcoins in existence, the more complex the puzzles are, meaning that mining will require even more energy for the powerful computers that can solve them (see Figure 4)<sup>15</sup>.*

**Figure 4: Bitcoin electricity consumption**

10/07/2014 to 14/06/2021



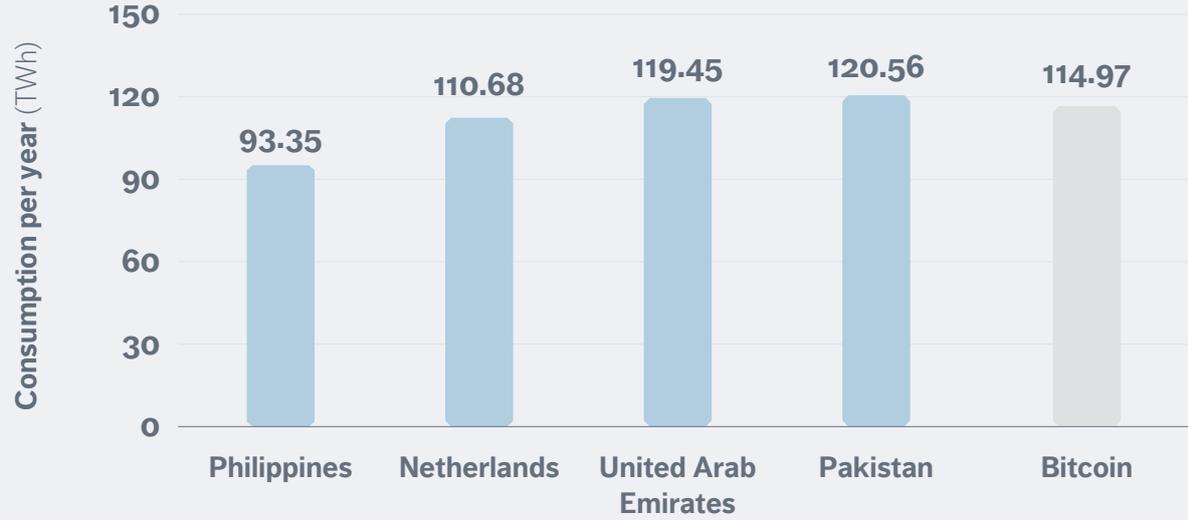
Given that the exact electricity consumption cannot be determined, the CBECI provides a range of possibilities consisting of a **lower bound** (floor) and an **upper bound** (ceiling) estimate. Within the boundaries of this range, a **best-guess** estimate is calculated to provide a more realistic figure that we believe comes closest to Bitcoin's real annual electricity consumption.

Source: Cambridge University

**Indeed, according to the recent study by the University of Cambridge, over 12 months Bitcoin mining consumed as much electricity transaction as a medium-sized country (see Figure 5)<sup>16</sup>.**

Moreover, the fact that 75% of global Bitcoin mining occurs in China makes things worse because in the areas where Bitcoin mining farms are situated, electricity is produced from burning thermal coal<sup>7</sup>. In order to meet Paris Agreement objectives, there is currently a global effort to drastically reduce the use of fossil fuels, and particularly coal, which during combustion produces more CO<sub>2</sub> than natural gas or petroleum.

**Figure 5: Bitcoin’s energy consumption ranking among countries**



Sources: University of Cambridge, U.S. Energy Information Administration country data, 2019 est.

The amount of electricity consumed by the Bitcoin network in one year could power all tea kettles used to boil water for:



Source: University of Cambridge<sup>18</sup>

# Is there an alternative to mining?

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There are the so-called “non-mined” cryptocurrencies, such as Ripple, Stellar, Cardano, EOS, and NEO. They do not need the support of energy-hungry high-powered computers to validate transaction blocks, and hence they are also cheaper to run.

Instead of puzzles, non-mined cryptocurrencies have the so-called “proof-of-stake”<sup>19</sup> process of selecting cryptocurrency owners to validate a block of transactions. Those that get selected tend to be large owners of the cryptocurrency that have transacted for longer than most.

The “proof-of-stake” blockchains are also more efficient. For example, Tezos can process up to 52 transactions per second, in contrast to Bitcoin’s five transactions per second<sup>20</sup>. And instead of millions of processors simultaneously processing the same transactions, it randomly picks one to do the job<sup>21</sup>.

## ESG Concern 5

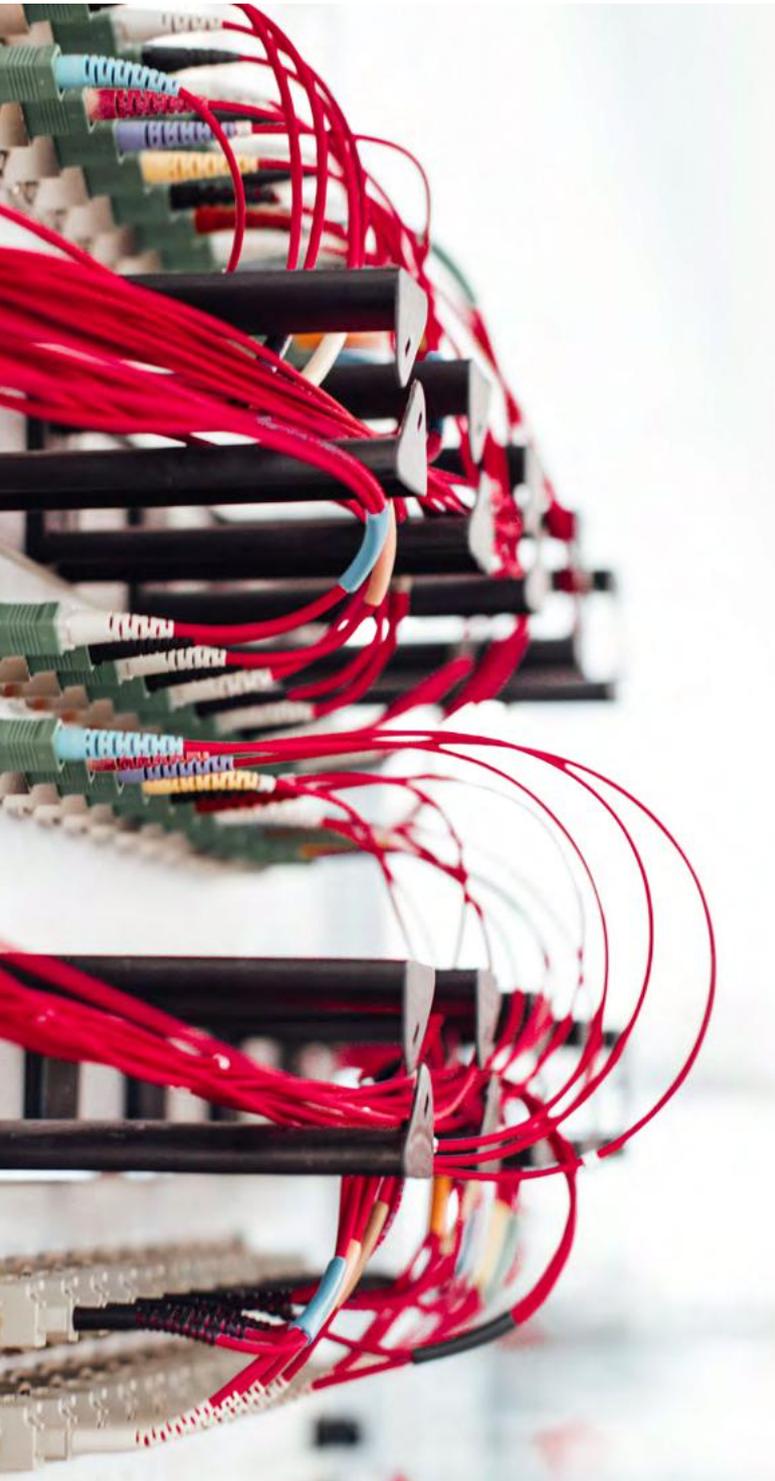
### Non-mined cryptocurrencies

***While unquestionably more energy efficient, the type of peer verification they use for validating transaction blocks these cryptocurrencies poses a governance problem. Under this system a few very large investors could get an overall control of making transactional records. If an entity manages to buy 51% of all coins, then it can, in theory, hold the network and its stakeholders hostage. In other words, a few major players could wield a lot of power within the proof-of-stake model, which simply wouldn't be possible with proof-of-work.***



**“Non-mined  
cryptocurrencies  
do not need the support  
of energy-hungry  
high-powered computers  
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blocks.”**

# In the final analysis



*To conclude, as things stand today, we believe cryptocurrencies have a long way to go to satisfy ESG criteria. Until there is a serious move to resolve the concerns stated in our paper, a significant direct investment in crypto can cause severe damage to ESG credentials of an asset manager or large institutional investor.*

*Firstly, it is because they are unregulated and are used by criminals for money laundering or shadow banking and tax evasion, or to steal money from investors through fraudulent crypto schemes.*

*Another big area of concern is cryptocurrencies' environmental impact. Bitcoin's enormous energy requirements for mining stem from the way this particular cryptocurrency was structured, which clearly had little regard for being economical with energy use. While there are cryptocurrencies that do not require nearly as much energy, Bitcoin is a giant among them. Therefore, the perception of crypto as energy hungry will not change until Bitcoin does. In theory, all it would take is Bitcoin re-writing its mining algorithm and changing the way their transactions are validated but no such plans have been announced.*

*Alternatively, the perception of energy overconsumption can change if the more energy-efficient proof-of-stake cryptocurrencies overtake their proof-of-work peers and start to dominate the market. There are some tentative signs that this may be a direction in which cryptocurrencies will be moving in the future. Ethereum, one of the largest<sup>22</sup>, is expected to transition from Proof of Work (PoW) to Proof of Stake (PoS) model in the near future<sup>23</sup>.*

*Another possible solution could be a switch from coal-sourced electricity in China to renewable energy<sup>24</sup>, as well as an introduction of carbon tax on cryptocurrencies<sup>25</sup>, although there is no obvious way to enforcing it effectively.*

*Possible developments on the regulatory side are easier to foresee. President Biden is proposing increased resources for the country's tax authorities to address the growth of cryptocurrencies and the risks they present in "facilitating illegal activity broadly including tax evasion", according to the US Treasury<sup>26</sup>. Under new US rules, businesses that receive crypto assets with a fair market value of more than USD 10,000 will need to report them to the tax authorities.*

*In Australia, the legislators are looking at including cryptocurrencies within existing money laundering legislation<sup>27</sup> and, if they are successful, this might become a trend with legislators in some key markets. Regulators in other major markets are becoming more aware of money laundering risks, which possibly may see their legislators addressing crypto money laundering through new legislation in the rest of the world.*

*All of the above are mainly theoretical solutions, with too many unknowns. For example, we still don't know if there is enough appetite among investors to pay a "green" premium for crypto using only solar power or other green energy sources when processing transactions. It is also far from certain if legislative efforts will prove effective and go far enough to make a real difference. We will continue to monitor carefully any future developments and adjust our view accordingly.*

# Notes & References

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- <sup>2</sup> <https://www.cnbc.com/2021/02/19/bitcoin-hits-1-trillion-in-market-value-as-cryptocurrency-surge-continues.html>
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- <sup>5</sup> <https://ciphertrace.com/2020-year-end-cryptocurrency-crime-and-anti-money-laundering-report/>
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- <sup>11</sup> <https://www.pwc.com/gx/en/audit-services/ifrs/publications/ifrs-16/cryptographic-assets-related-transactions-accounting-considerations-ifrs-pwc-in-depth.pdf>
- <sup>12</sup> <https://www.bbc.com/news/stories-50435014>
- <sup>13</sup> <https://edition.cnn.com/2021/06/07/politics/colonial-pipeline-ransomware-recovered/index.html>

<sup>14</sup> P2P is created when two or more PCs are connected and share resources without going through a separate server computer.

<sup>15</sup> <https://www.sciencedirect.com/science/article/abs/pii/S2542435121000830>

<sup>16</sup> <https://cbeci.org/cbeci/comparisons>

<sup>17</sup> <https://www.nature.com/articles/s41467-021-22256-3.pdf>

<sup>18</sup> <https://cbeci.org/cbeci/comparisons>

<sup>19</sup> The Proof-Of-Stake concept states that a person can mine or validate block transactions according to how many coins they hold.

<sup>20</sup> <https://medium.com/tqtezos/proof-of-work-vs-proof-of-stake-the-ecological-footprint-c58029faee44>

<sup>21</sup> <https://academy.bit2me.com/en/what-is-tezos-xtz/>

<sup>22</sup> With the market cap of about USD500 billion, Ethereum is the second largest after Bitcoin. <https://www.analyticsinsight.net/top-10-cryptocurrencies-in-value-in-may-2021/>

<sup>23</sup> <https://fortune.com/2021/05/27/ethereum-founder-vitalik-buterin-proof-of-stake-environment-carbon/#:~:text=POS%20is%20an%20alternative%20to,by%20the%20end%20of%202021>

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*Special thanks to Quentin Stevenart.*



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