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Bitcoin or the environment: you choose

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Berlin, Dezember 2017

Abstract:

People are turning their attention towards digitization: whether it is artificial intelligence, the Internet of things, big data or industry 4.0, the world as we know it is digitally transforming itself. In spite of that, the impact on the environment of such a transformation is a topic seldom discussed. In this article, the author cleverly explores the intricate relationship of the digital currency with its less known effects on the environment. He then questions the efficiency of the cryptocurrency and critically explores the issue of accountability.

As he asserts, the carbon footprint per transaction of bitcoin is estimated to be 117.63 kg of CO₂, or about the same as the footprint of someone flying economy class from Amsterdam to Frankfurt. Put in relative terms, he suggests, the dynamics of the bitcoin network are just unsustainable. Distancing himself from the traditional discourse around the reasons why not to invest in the most famous cryptocurrency in circulation in the market right now, the author aims at raising awareness of a problem that has been disregarded about how and at what environmental cost the bitcoin network performs.

The case of someone buying a pizza for 10.000 bitcoins in 2010 – today worth more than 100 million US dollars, helps understanding why people are going in frenzy buying the cryptocurrency that has been performing at record heights (Price, 2017). The volatility of bitcoin is such that I did not bother to double-check the price of 10.000 bitcoins as of today, because once this article gets published the number would be already obsolete.

Bitcoin was created, among other reasons, to foster efficiency gains in electronic payments. Being a fan of pizza, I was especially interested in an attempt by Thomas Di Fonzo, executive producer at The Wall Street Journal, to buy a \$10 USD pomodoro Domino's Pizza with bitcoins. He ended up paying a total of 0.0052 bitcoin for the pizza, or the equivalent to \$76.16 USD that day: that is more than 7 times the original price! It was so because the vendor failed to update the prices of the cryptocurrency, an almost impossible task these days (Hotz & Di Fonzo, 2017).

Di Fonzo's attempt made clear that the efficiency aim of bitcoin was far from being achieved. He had to wait until the payment was processed through an intermediary, ended up overpaying for the pizza, and evidenced that there is a lack of infrastructure to enable bitcoin to become a daily means of payment. If bitcoin is to become a means of payment, both companies and consumers will have to adapt. The costs of adapting current systems to the nature of the cryptocurrency are yet to be quantified by a formal study, but this clearly influences the efficiency potential of bitcoin.

The proven impracticality and fragility of bitcoin as a means of payment in brick-and-mortar establishments seems not to deter people from buying coins. In fact, not even the extreme volatility, the lack of certainty about its origins, the absence of regulations and the legality issues of the cryptocurrency have shown to have almost no effect in the growth trends in popularity and price of bitcoin.

In an interview for Bloomberg, the Winklevoss twins (said to be the first "Bitcoin billionaires") affirmed that bitcoin is like "gold 2.0" and that "*whatever your reasons for investing in gold - whether it's scarce, durability, portability, fungibility - we think that bitcoin matches or beats gold across the board*" ("Winklevoss Twins Say Futures Trading Is Just the Beginning Phase for Bitcoin," 2017). In that order of ideas, the fact that bitcoin is not practical as a currency is irrelevant since it serves a purpose of storing value more like a commodity. It is not usual that someone takes the equivalent of \$10 USD in gold to pay for a pomodoro pizza. What comes to question at this point is if Bitcoin is efficient as a means of storing value, and the answer is no.

In a 2016 research for Motherboard, Sebastiaan Deetman modeled a scenario where the bitcoin mining network¹ *“may draw over 14 Gigawatts of electricity by 2020, equivalent to the total power generation capacity of a small country, like Denmark for example”*. That scenario was called by him *“pessimistic”*, whereas in a *“optimistic”* one he predicted that just mining one bitcoin in 2020 *“would require a shocking 5,500 kWh, or about half the annual electricity consumption of an American household”* (Deetman, 2016).

Having more empirical data as of today, the energy-intensive process of bitcoin mining is estimated by the World Economic Forum to already use the same amount of electricity as Denmark in a year (Martin, 2017). According to this, the pessimist scenario calculated by Deetman was reached 3 years before his original prognosis.

Shockingly, the Bitcoin Energy Consumption Index (2017), *“the first real-time estimate of the energy consumed by the bitcoin network”*, shows that the carbon footprint per transaction is 117.63 kg of CO₂, whereas it is estimated that the carbon footprint of someone flying economy from Amsterdam to Frankfurt amounts 128 kg of CO₂ (myclimate, 2017). Furthermore, the bitcoin Energy Consumption Index points at the fact that Bitcoin’s biggest problem *“is not even its massive energy consumption, but that the network is mostly fueled by coal-fired power plants in China. Coal-based electricity is available at very low rates in this country. Even with a conservative emission factor, this results in an extreme carbon footprint for each unique bitcoin transaction”* (“Bitcoin Energy Consumption Index,” 2017).

If bitcoin was a country, it would rank today as the 60th country in the world by energy consumption, beating Serbia, Denmark and Belarus, and just behind Bulgaria, Qatar and Hungary. In relative terms, the energy used by the bitcoin network could be used to power 0.8% of the United States, 10.6% of the United Kingdom and 51.9% of the Czech Republic (“Bitcoin Energy Consumption Index,” 2017).

According to the index and compared to other payment systems, the energy used in the bitcoin network could power today as many as 3.179.790 households, while the Visa network could only power 50.000 (without taking into account the energy consumption of the facilities of Visa).² The bitcoin network is just unsustainable.

In the year 2016, *“almost 120,000 bitcoin worth around \$78 million USD were stolen from Hong Kong-based Bitfinex, one of the most popular cryptocurrency exchanges”* (Hickey, 2017). Last week, \$64 million USD worth of bitcoin were stolen in what was called a *“sophisticated hack”* by the *“Slovenian-based bitcoin mining marketplace NiceHash”* (Gibbs, 2017). Since there is no central bank regulating the operations of the network, those coins are presumably lost forever. No one is accountable for what happens inside of the network, and as investors lost millions of dollars to hackers, we all loose to the environmental effects of bitcoin.

The case of bitcoin is complicated since it requires transgovernmental public policy and structures of digital policy-making that do not exist. Indeed, the digital world has a real impact in the tangible world as evidenced by bitcoin. Its unsustainable network and its energy-intensive processes are not a secret but because no one is accountable there is not enough environmental activism that can be done. We are in a historical moment where digital transformation is at the center of the discussions, but responsible digital transformation is essential.

¹ *“Bitcoin transactions are validated and processed by a decentralized network of volunteers, usually hosting dedicated hardware to perform calculations, called “hashes,” to find solutions to a complex mathematical algorithm in return for a reward of brand-new bitcoins plus some transaction fees.”* By the end of march 2016, the *“total bitcoin mining network currently comprises a calculation speed of over 800 petahashes per second, which requires over 10,000 metric tonnes of hardware, considering that even the newer machines weigh over 12 kilograms each (15 grams per GHash/sec. on average in the analysis below). That is enough material to build another Eiffel tower.”* (Deetman, 2016)

² For the underlying assumptions, visit: <https://digiconomist.net/bitcoin-energy-consumption>

Raising awareness of the impact of bitcoin in the tangible world, including the environment, is an important task for the global civil society. It is a challenge for each one of us to find avenues to regulate the transnational digital world that permeates every sphere of human interactions nowadays. It is crucial to ask ourselves if this is the digitization we want for the world: disconnecting the effects of the digital world to the tangible world and making the environment even more vulnerable to human action as it is right now. Economists would name the environmental impact of bitcoin as an “externality”, but at this stage, if you buy bitcoin, you are complicit of the detriment of the environment.

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