
DECARBONISING CRYPTOCURRENCY: LEGAL AND POLICY CHOICES FOR REDUCING THE ENVIRONMENTAL IMPACT OF BLOCKCHAIN

Aaloka Dhanyamraju, BA LLB Hons., Jindal Global Law School, Sonipat

ABSTRACT

Human society is at a point in its development where governments across the world are scrambling to reduce energy consumption and striving to meet their Paris Agreement climate change commitments. This article examines government interventions to mitigate negative environmental externalities caused due to high energy consuming Blockchain technology designs used by cryptocurrencies. The author explores how to promote environmentally sustainable development of cryptocurrencies without damaging this valuable sector. The article concludes by identifying appropriate fiscal policy options for this purpose.

Keywords: Blockchain, Bitcoin, Cryptocurrency, Cryptocurrency Mining, Environmental Taxation, Fiscal tools.

Introduction

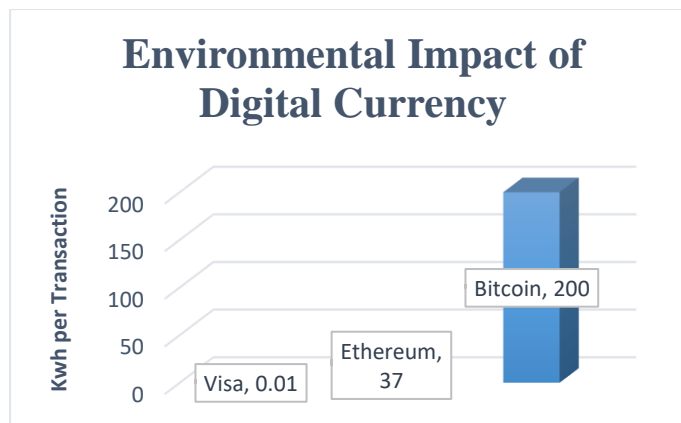
The accelerated pace of development of new technologies has brought about a drastic change in the traditional system of economic and social organisation. The conventional ways in which commercial transactions take place, have also changed. In recent years many types of cryptocurrency have emerged that act as means of exchange. Unlike traditional currencies, cryptocurrencies are independent from national borders, central banks or governments. The phenomenon of cryptocurrencies has been analysed from multiple perspectives ranging from economics, engineering, political science etc. This article attempts to analyse the environmental impact of cryptocurrencies and the ways in which regulators can deal with the issue. One of the most keenly debated issues is the significant electrical energy needs in the cryptocurrency mining process and its potential environmental impact. The generation of different cryptocurrencies involves the use of a large number of computers working simultaneously. It has been pointed out that Bitcoin mining is responsible for 13,000 kilograms of carbon dioxide emissions for each bitcoin mined.¹ Policy makers across the world have suggested various solutions to mitigate or eliminate the adverse effects of cryptocurrency mining. The author has attempted to explore how to promote environmentally sustainable development of Blockchain. The article studies existing regulatory policy approaches towards digital currencies as a basis for further legal policy tools targeted at mitigating energy consumption of Blockchain technologies.

Cryptocurrency and Global Warming

If cryptocurrencies are not regulated to ensure environmental sustainability, Bitcoin emissions alone could push global warming by 2°C within the next three decades.² An analysis by the University of Cambridge estimated that Bitcoin mining consumes nearly 121 terawatt hours each year. This is more than the energy consumption of Google, Apple, Facebook and Microsoft combined. The comparison of Bitcoin with other types of payment mechanisms is shown graphically below:

¹ Nández Alonso, S.L.; Jorge-Vázquez, J.; Echarte Fernández, M.Á.; Reier Forradellas, R.F. *Cryptocurrency Mining from an Economic and Environmental Perspective. Analysis of the Most and Least Sustainable Countries*. *Energies* 2021, 14, 4254. <https://doi.org/10.3390/en14144254>

² Mora, C., Rollins, R.L., Taladay, K. et al. Bitcoin emissions alone could push global warming above 2°C. *Nature Clim Change* 8, 931–933 (2018). <https://doi.org/10.1038/s41558-018-0321-8>



The situation is getting worse because of intense competition amongst cryptocurrency miners, as rewards are continually cut in half. In order to make their work financially worthwhile, miners have to either process more transactions or reduce the amount of electricity they use. Consequently, miners either seek out the cheapest electricity or upgrade to faster and more energy intensive computers. In the five-year period between 2015 and 2020, Bitcoin energy consumption went up by more than 60 times. Less than 40% of this energy came from renewable sources.³ A study conducted by Cambridge University showed that nearly 60% of Bitcoin mining is done in China where Bitcoin miners depend mostly on coal-based energy. Another important point is that greenhouse gas emissions not only cause air pollution but also lead to the loss of valuable human lives. It is estimated that air pollution leads to nearly 3 million deaths each year globally.⁴

Water Pollution

The environmental impact of cryptocurrencies is not restricted to greenhouse gas emissions. Across USA, digital currency miners have converted abandoned power plants into huge Bitcoin mining facilities. Greenidge Generation, New York is an example of a coal-based power plant that has now become one of the largest cryptocurrency mines in the USA. Each day, Greenidge draws nearly 140 million gallons of fresh water from Seneca Lake in order to cool the plant. When the water is discharged back into the lake, it is much hotter than the lake's average

³ Renee Cho, *Bitcoin's Impacts on Climate and the Environment*, Columbia Climate School, (Sept. 20, 21), <https://news.climate.columbia.edu/2021/09/20/bitcoins-impacts-on-climate-and-the-environment/>

⁴ L. Badea, M. C. Mungiu-Pupăzan; *The Economic and Environmental Impact of Bitcoin*, IEEE Access, vol. 9, pp. 48091-48104, 2021, doi: 10.1109/ACCESS.2021.3068636

temperature. Thus, aquatic life and ecology is endangered. The plant's large intake pipes also suck in and kill larvae, fish and other species.

Policy Alternatives for Limiting Damage

In many countries, experts have proposed reusing heat derived from cryptocurrency mining for heating family dwellings. Such solutions have been proposed in Finland, Russia and Canada. Other alternatives include incorporating new algorithms that require reduced energy consumption. Some stakeholders have suggested imposing a total ban on cryptocurrency transactions. Recently Tesla's President made an announcement refusing to accept cryptocurrencies as a means of payment on the grounds of environmental sustainability.

As there is increasing awareness about the environmental impact of cryptocurrencies, a number of projects seeking to reduce their carbon footprint have been set up. One such initiative is the Crypto Climate Accord with a goal of making Blockchains run on 100% renewable energy by 2025. Another aim is to make the entire cryptocurrency industry achieve net zero emissions by 2040.⁵ A few smaller cryptocurrencies like Ethereum aim to reduce their energy use by changing over to a validation system called proof of stake instead of proof of work. Other ideas for green cryptocurrencies involve moving Bitcoin operations next to oil fields. The waste methane gas can be piped to generators and the power can be used for Bitcoin mining. Experts say that many of these ideas are theoretically possible but they may not be pragmatic because of the high level of expenditure involved.

Further, while a section of policy makers supports intervention in order to internalise negative externalities, others feel that the market itself is best placed to correct such externalities. Internationally accepted environmental principles advocate the need to follow the polluter pays principle. This principle is also enshrined in Article 191 (2) of the Treaty on the Functioning of the European Union. The objective is not just to raise revenue, it is to make polluters financially responsible for the harm caused by them. This encourages a switch to a less polluting method. The principle can also be explained as a continuous incentive for pollution abatement and technical innovation. For instance, imposing a tax on plastic bags leads to a switch to paper bags. The design of the tax has to take into account who should ultimately bear the cost- the consumer or the supermarket. Regulators who wish to impact behavioural patterns

⁵ Renee Cho, *Bitcoin's Impacts on Climate and the Environment*, Columbia Climate School, (Sept. 20, 21), <https://news.climate.columbia.edu/2021/09/20/bitcoins-impacts-on-climate-and-the-environment/>

need to determine which individuals or entities should be targeted with measures that will ultimately have the desired effect. In case of cryptocurrencies, the technology developers are definitely capable of designing cleaner technology but they may not be motivated to do so if end users continue to demand environmentally unsustainable technology. In the current scenario, the objective can be to motivate the developers to amend their algorithms in ways which require less computational energy. As already mentioned, proof of work requires much greater energy usage compared to other alternatives.

Taxation of Cryptocurrency

If governments fail to intervene in the free market, they would be providing a *de facto* subsidy to the polluters. This would mean that future developers of Blockchain technology would not be encouraged to design environmentally sustainable technologies. A lack of intervention may make it more likely that new technologies would follow the Bitcoin route. This path dependence or inertia of prior choices based on factors like sunk investment costs may lead to new technologies not being adopted even if they are economically feasible. Thus, the need of the hour is smart government regulation which provides incentives for economic growth and innovation based on clean energy. Till date the challenge of regulating the designs of Blockchain technology for environmental purposes has not been taken up by the regulators. The focus has been on taxing cryptocurrencies because they are being actively traded.

The treatment of digital currency for tax purposes depends on whether it can be considered “money” in legal terms. If Bitcoin is considered money, then the tax implications differ from if it is a commodity. Christine Legarde, President of the European Central Bank gives a number of reasons for not considering cryptocurrencies as money. Her reasoning includes the fact that cryptocurrencies are too energy intensive.⁶ However, in *SEC vs Shavers* it was ruled that Bitcoin is a currency because it can be used to purchase goods.⁷ The Bank for International Settlements takes the position that cryptocurrencies are not the same as actual currencies as they have not been guaranteed by any central bank. The International Monetary Fund also takes a similar position and argues that a currency should be issued by a central bank and be supported by a government. The US Commodity Futures Trading Commission provided an alternative definition and classified cryptocurrencies as commodities in *United States of*

⁶ Jon Trudy, *Decarbonizing Bitcoin: Law and policy choices for reducing the energy consumption of Blockchain technologies and digital currencies*. Energy Research & Social Science (July, 2018) doi:10.1016/j.erss.2018.06.009

⁷ *SEC v. Shavers*, No. 4:13-CV-416, (E.D. Tex. Sept. 18, 2014)

*America vs Francisco Riordan*⁸. The legal position in the UK is that profits on digital currency are taxable under capital gains tax, inheritance tax and corporation tax. In both the USA as well as the UK, no new laws have been passed to tax digital currencies.

Incentivising Low-Carbon Technology

The need of the hour is to use environmental taxes or other fiscal tools to promote modifications in Blockchain technologies. Non- fiscal policy interventions can also be considered. Fiscal tools will not be successful without greater international cooperation. If only one nation imposes a tax on a technology requiring higher carbon dioxide per gigahash, the move may provoke a relocation of technology designers and negatively impact the country's economy. At present, there is a competition between nations for financial technology startups to be hosted within their jurisdiction. Such companies are not only highly mobile, they often operate outside major jurisdictions. For example, Bitcoin's website is owned by a limited liability company in the Federation of St. Kitts and Nevis. Thus, attempts to introduce regulations, taxes or charges on financial technology companies may lead to their relocation. Alternative fiscal tools such as government grants or academic research funds for developers focusing on Blockchains with low carbon dioxide per gigahash could be a better option.

Multiple fiscal tools are available to regulate the use of verification devices by cryptocurrency miners. In case the devices are imported, it is possible to introduce a customs duty based on the energy consumption. Belgium's eco-tax law achieved a similar result.⁹ In case the device is purchased domestically, a VAT (Value Added Tax) or any similar tax can be imposed upon less energy efficient machinery to make it less attractive for the buyer. Another option is to make registration of such verification devices compulsory and introduce an annual emissions tax. There should be differential rates based on the emissions output of the device. The Czech Republic has a policy of charging different rates on different types of emissions by industry.¹⁰

Instead of using carbon dioxide per gigahash, carbon dioxide per transaction can also be used as a measure. Differentiation between transaction types based on their carbon output could

⁸ Coinflip, Inc., d/b/a Derivabit, and Francisco Riordan, CFTC Docket No. 15-29, 2015 WL 5535736 (Sept. 17, 2015).

⁹ Articles 369 to 401 of the Law of 16/7/1993 Completing the Federal Structure of the State (Moniteur Belge, 20/7/1993, p. 17013).

¹⁰ Study on Environmental Taxes and Charges in the EU Final Report: Annex 3, The Czech Republic. <http://ec.europa.eu/environment/enveco/taxation/pdf/annex3.pdf>.

motivate users to switch to less carbon intensive technologies. A person conducting an electronic transaction would be discouraged to utilise a certain technology if a tax was to be charged. This type of tax could apply to brokers of financial products such as Bitcoin exchanges. Another possible method is to prohibit certain types of transactions with emissions above a particular threshold.

Conclusion

The possibilities of Blockchain are endless and various climate change issues can be resolved through regulation and provision of incentives. Incentives can motivate innovators to design financially rewarding Blockchain technology while simultaneously achieving environmental goals. This article has explored options for policy makers globally without focusing on a particular jurisdiction. While choosing a particular policy, the economic reality of the country in question must be taken into account. Though there is no perfect solution, there are certainly options to achieve the internalisation of negative externalities. The objective is to switch the type of technology developed to more sustainable alternatives. The option to target physical machines/miners is available, enabling import duties. This would reduce such consumption within a jurisdiction but may drive it overseas. Targeting ownership and transactions through existing or new legislation can also be effective in altering the demand for such technology. All such tools can be designed unilaterally by an environmentally conscious State, but there is a need for an international response.