
Money is Morphing - Cryptocurrency can Morph to be an Environmentally and Financially Sustainable Alternative to Traditional Banking

Clovia Hamilton

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Money is Morphing - Cryptocurrency can Morph to be an Environmentally and Financially Sustainable Alternative to Traditional Banking

*Clovia Hamilton**

ABSTRACT

Bitcoin is the best-known cryptocurrency for which blockchain was invented. Blockchain is a digital, decentralized distributed ledger that records transactions that take place on peer-to-peer networks. Creating a single new bitcoin takes as much electricity as a typical US household consumes in 57 days; and the annual energy consumption is equivalent to that of Sweden at 135 TWh. The energy consumption issue related to crypto mining has been debated. The US SEC's approval of the new spot Bitcoin ETFs will likely result in an increase of crypto mining and heightened concerns. This research is a bibliometric study conducted using the critically appraised topic method using 201 publications between Jan 1, 2013 and Dec 31, 2022. The research focuses on the pros and cons of using cryptocurrency. A cryptocurrency benefit is that digital currency can provide improved access to banking and inclusion for many people in underdeveloped countries that lack banking services. This study addresses how cryptocurrency can be a more sustainable alternative to traditional banking, traditional community financial institutions and how traditional currencies can morph by embracing digital financial technology. Financial institutions can remain relevant in the face of digital asset and cryptocurrency innovations. Ten recommendations for cryptocurrency policies and legal regulations were gleaned from this bibliometric study.

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Keywords: cryptocurrency; decision-making on sustainability strategies; legal currency; digital currency; Bitcoin; Ethereum; blockchain; fintech; deFi; financial institutions; unbanked; legal tender; ESG; energy

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I. INTRODUCTION

Jon Ungerland, COO of DaLand and CUSO fintech consulting said, “Money is morphing and . . . each month the global economy sees more users, total capital, and transactions in portfolios and networks outside traditional banking.”¹ Further, DaLand and CUSO’s CEO Jeff Levesque advocates that: It’s becoming increasingly difficult to imagine a world where community financial institutions remain relevant in the face of all these digital asset and cryptocurrency innovations, without an efficient, elegantly simple, and cost-effective path to use their existing

1. DaLand Cuso, *Fintech Plugs Community FIs Into the Cryptocurrency/Digital Asset Era*, PR NEWswire, (Aug. 27, 2019, 8:41 AM) <https://www.prnewswire.com/news-releases/fintech-plugs-community-fis-into-the-cryptocurrencydigital-asset-era-300907227.html>.

technologies to advance into service and support these new assets and currencies.”²

Banks have invested widely in Blockchain technology.³ By 2018, financial technologies (fintech) investment reached \$120 billion USD in the USA.⁴ By 2020, the development, integration, and acquisition of emerging fintech markets by banks totaled more than \$1 trillion USD.⁵ However, the number of transactions that Bitcoin can process is less than 7 per second.⁶ In comparison, in 2013, VISA processed 47,000 per second.⁷ Now it is 76,000 per second.⁸ Thus, the full implementation of blockchain is not anticipated to be feasible until 2029.⁹ An IBM survey of 200 global banks showed that 65% of the banks intended to roll out blockchain-based products.¹⁰

The most well-known cryptocurrency for which blockchain was created is Bitcoin.¹¹ Blockchain is a decentralized distributed ledger that is digital and used to record transactions on peer-to-peer networks.¹² The energy required to create one new bitcoin is similar to what the average American home uses in 57 days, and Sweden’s yearly energy usage of 135 TWh.¹³ The year 2021 was a cryptocurrency roller coaster ride. In April 2021, Daniel Pinto, JP Morgan Chase’s President and COO stated that pricing cryptocurrency high or low cannot be determined because it is an asset class property based on the expectation that it will be

2. *Id.*

3. Roy Cerqueti et al., *Preface: Recent Developments in Financial Modelling and Risk Management*, 299 ANNALS OF OPERATIONS RSCH. 1,1 (2021).

4. Digital Finance Task Force, *Digital Finance, a Lifeline During COVID-19 Crisis, Can Deliver Long-Term Financing of The Sustainable Development Goals* (Aug. 26, 2020) <https://www.undp.org/press-releases/digital-finance-lifeline-during-covid-19-crisis-can-deliver-long-term-financing-sustainable-development-goals>

5. *Id.*

6. Dejan Vujčić, et al., *Blockchain Technology, Bitcoin, and Ethereum: A Brief Overview*, 2018 17th INTERNATIONAL SYMPOSIUM INFOTEN-JAHORINA, 1, 3 (2018), 10.1109/INFOTEH.2018.8345547.

7. *Id.*

8. Visa Fact Sheet by Visa, <https://usa.visa.com/dam/VCOM/global/about-visa/documents/visanet-factsheet.pdf> (2020).

9. Paul Schaus, *Blockchain Projects will Pay Off - 10 Years from Now*, AMERICAN BANKER, (Dec. 2, 2016, 11:00 AM) www.americanbanker.com/opinion/blockchain-projects-will-pay-off-10-years-from-now.

10. Tanaya Macheel, *Banks will Start Actually Using Blockchain Next Year: IBM Report*, AM. BANKER, (Sept. 28, 2016, 4:30 AM), <https://www.americanbanker.com/news/banks-will-start-actually-using-blockchain-next-year-ibm-report>.

11. Canadian Press, *Uniserve to Launch Blockchain*, (Can.) (Dec. 7, 2017, 9:01 ET).

12. *Id.*

13. Chris Horn, *Inter Milan Cryptocurrency Shows Another Side of Digital Coins*, IRISH TIMES, (July 28, 2021, 3:45 PM) (Ir.), <https://www.irishtimes.com/business/innovation/inter-milan-cryptocurrency-shows-another-side-of-digital-coins-1.4631783>.

purchased; otherwise, it has no value.¹⁴ This makes Bitcoin at risk of something happening to destroy confidence in it.¹⁵ But Chase accommodates clients that are interested in some limited trading activity.¹⁶ Chase “only allowed private wealth clients to invest in an actively managed bitcoin fund, with crypto firm NYDIG providing custody services.”¹⁷ Yet, although Chase’s CEO, Jamie Dimon, had a well-established distrust of cryptocurrency, by July 2021, Chase began providing its wealth management clients access to cryptocurrency products.¹⁸

China announced having no desire to replace the US dollar with digital yuan.¹⁹ Yet, the central banks were at varying stages of decision-making.²⁰ At the August 2021 Aspen Security Forum, the US Securities and Exchange Commission (“SEC”) Chair Gary Gensler announced its desire to increase cryptocurrency regulations.²¹ There is fear over the use of cryptocurrency for nefarious purposes. Federal Reserve Chair Jerome Powell stated that with respect to cybersecurity, the reserve has no authority over cryptocurrency except when it comes to consumer protection and money laundering; but will make sure that banks are resilient.²² Chairman Powell stated that the Federal Reserve will release a study and invite feedback from the general public in order to weigh in on issues.²³

14. Will Daniel, *JP Morgan Co-President Daniel Pinto Discussed the European Super League, Managing SPAC Risks, and the Crypto Craze in a Recent Interview. Here are the 10 Best Quotes*, BHNBN, (Apr. 23, 2021, 11:30 AM), <https://markets.businessinsider.com/currencies/news/jp-morgan-daniel-pinto-european-super-league-spacs-crypto-quotes-2021-4-1030339536?op=1>.

15. *Id.*

16. Emily Mason, *Bitcoin About-Face: JPMorgan Opens Crypto Trading to All Clients*, FORBES, (July 22, 2021, 12:00 PM), <https://www.forbes.com/sites/emilymason/2021/07/22/bitcoin-about-face-jpmorgan-opens-crypto-trading-to-all-clients/?sh=2c79d23744a5>

17. *Id.*

18. *Id.*

19. Bloomberg News, *China Says It Has No Desire to Replace Dollar with Digital Yuan*, BLOOMBERG, (Apr. 18, 2021, 7:33 AM), <https://www.bloomberg.com/news/articles/2021-04-18/china-to-focus-on-domestic-use-of-digital-fx-first-zhou-says>.

20. See, Inter-agency Task Force on Financing for Development, *People’s Money Harnessing Digitalization to Finance a Sustainable Future*, 21, 29, U.N. (Aug. 2020) [hereinafter *People’s Money*] <https://unsdg.un.org/sites/default/files/2020-08/DF-Task-Force-Full-Report-Aug-2020-1.pdf>.

21. Robert Schmidt & Benjamin Bain, *New SEC Boss Wants More Crypto Oversight to Protect Investors*, BLOOMBERG, (Aug. 4, 2021, 11:01 PM), <https://www.bloomberg.com/news/articles/2021-08-03/will-government-regulate-crypto-sec-chair-gary-gensler-on-bitcoin-and-oversight>.

22. Wall Street Journal, *Transcript: Fed Chairman Jerome Powell’s Postmeeting Press Conference*, (June 19, 2019, 5:02 PM), <https://www.wsj.com/articles/transcript-fed-chairman-jerome-powells-postmeeting-press-conference-11560978119?tpl=cb>

23. Craig Torres, *Powell Seeks Input as Fed Digs Deeper into Digital Currencies*, BLOOMBERG, (May 20, 2021, 1:00 PM), <https://www.bloomberg.com/news/articles/2021-05-20/powell-says-fed-to-issue-report-on-u-s-digital-currency>.

In April 2021, the cryptocurrency market exceeded \$2 trillion.²⁴ In 2021, it became illegal to trade in China because they opine that cryptocurrency is a very high-risk investment, trading contracts are not protected by Chinese law, business failures, lack of issuance by monetary authorities and “no fiscal attributes such as legal compensation.”²⁵ China’s Inner Mongolia Autonomous Region vowed to clean up and shut down cryptocurrency mining in order to reduce carbon emissions in its coal-based region.²⁶

With regards to volatility, for example, when Elon Musk says something about cryptocurrency, the price moves. When Tesla stopped accepting Bitcoin for car purchases over climate concerns, there was a broad sell off in crypto currencies.²⁷ Cathie Wood is the Chief Investment Officer of Ark Investment Management whose clients previously profited on Bitcoin; but after Musk’s announcement, they had to sell at the bottom.²⁸ Although tech stock slid, Wood bought Tesla and got out of Apple advocating that “we are not going back to the old world” and “innovation is on sale.”²⁹ Given concerns about energy consumption and emissions, in March 2022, President Joe Biden ordered a costs-benefits report on cryptocurrency and its blockchain technology; this report is the joint responsibility of the National Climate Adviser Gina McCarthy, White House Office of Science and Tech Policy, EPA, Energy and other offices.³⁰

The Ethereum blockchain was founded by Vitalik Buterin.³¹ Ethereum uses the cryptocurrency Ether rather than Bitcoin.³² China cracked

24. Pete Schroeder, *U.S. Treasury, Financial Industry Discuss Cryptocurrency ‘Stablecoins’*, REUTERS, (Sept. 10, 2021, 5:33 PM), <https://www.reuters.com/technology/exclusive-us-treasury-financial-industry-discuss-cryptocurrency-stablecoins-2021-09-10/>.

25. CGTN, *China bans Financial, Payment Institutions from Crypto Business amid price Volatility*, (May 19, 2021 5:58 PM) <https://news.cgtn.com/news/2021-05-19/China-bans-financial-payment-institutions-from-crypto-business-10og4diN0t2/index.html>. See, Rain Xie, *Why China had to “Ban” Cryptocurrency but the U.S. did not: A Comparative Analysis of Regulations on Crypto-Markets Between the U.S. and China*, 18 WASH. UNIV. GLOB. STUD. L. REV. 457 (2019).

26. CGTN, *China’s Crackdown on Bitcoin Mining, Trading Extend its Losses*, (May 22, 2021, 11:48 AM), <https://news.cgtn.com/news/2021-05-22/China-s-crackdown-on-bitcoin-mining-trading-extend-its-losses-10sKyX2EksE/index.html>.

27. Harry Robertson, *Bitcoin Plunges to \$42,000 after Elon Musk Tweet-Storm but Rebounds after he Clarifies Tesla Hasn’t Sold its Holdings*, BUS. INSIDER, (May 17, 2021, 8:52 AM), <https://www.businessinsider.in/cryptocurrency/news/bitcoin-crashes-to-42000-after-elon-musk-tweet-storm-but-rebounds-after-he-clarifies-tesla-hasnt-sold-its-holdings/articleshow/82705281.cms>.

28. Carol Massar, *ARK CEO Cathie Wood on Crypto, ETF Markets*, BLOOMBERG, (May 19, 2021, 12:13 AM), <https://www.bloomberg.com/news/videos/2021-05-19/ark-s-wood-on-crypto-etf-markets-video>.

29. *Id.*

30. Corbin Hiar & E&E News, *Bident Orders Report on Climate Risk of Cryptocurrencies*, SCI. AM., (Mar. 10, 2022)

31. Nicholas Paumgarten, *The Stuff Dreams Are Made Of*, 94 THE NEW YORKER 62 (Oct. 15, 2018).

32. *Id.*

down harder on Bitcoin.³³ According to an April 2020 University of Cambridge report, China is home to more than 70% of all cryptocurrency mining capacity.³⁴ In May 2021, Bitcoin dropped in value and some cryptocurrency mines closed in China after an announcement that the hydroelectric powered city Sichuan aims to root out Bitcoin and Ethereum mining within one year.³⁵ The Chinese government promised it would close the mines due to energy use concerns.³⁶

Consensus systems are used to achieve decentralization of the distributed ledger of a blockchain cryptocurrency. These systems “ensure that everyone agrees on the validity of the transactions that have led to the ledger’s state and their order.”³⁷ There are various consensus, including: proof of stake (“PoS”), proof of work (“PoW”), proof of capacity (“POC”), proof of commitment (“PoC+”), and proof of authority (“PoA”).³⁸ Bitcoin is based on a PoW consensus scheme which encourages wasteful energy consumption by requiring that transactions get published in packaged groups of 1MB timestamped block with a reference identification.³⁹ In 2018, Ethereum began switching to PoS, limiting the number of blocks that can be mined to the number of coins a miner owns.⁴⁰ Marc Blinder, Chief Product Officer of the blockchain startup AIKON, explained that:

Server owners on PoS Systems are called “validators” — not “miners.” They put down a deposit, or “stake” a large amount of cryptocurrency, in exchange for the right to add blocks to the blockchain. In [PoW] systems, miners compete with each other to see who can problem-solve the fastest in exchange for a reward, taking up a large amount of energy. But in PoS systems, validators are chosen by an algorithm that takes their “stake” into account. Removing the element of competition saves energy and allows each machine in a PoS system to work on one problem at a time, as opposed to the [PoW]

33. Tom Mackenzie, *Hydro-Rich Chinese City Said to Clamp Down On Crypto Mining*, BLOOMBERG, (June 18, 2021) <https://www.bloomberg.com/news/articles/2021-06-18/hydro-rich-chinese-city-is-said-to-clamp-down-on-crypto-mining?embedded-checkout=true>.

34. CGTN, *supra* note 26.

35. Shawn Tully, *Can Bitcoin Go Green?*, 184 FORTUNE, 76, 78 (Aug./Sept. 2021)

36. CGTN *supra* note 26.

37. M. Edwards, et al., *A Review of Quantum and Hybrid Quantum/Classical Blockchain Protocols*, 19 QUANTUM INFO. PROCESSING 184, 187 (May 2020).

38. Signum, *From Proof of Capacity to Proof of Commitment (POC+) for Even More Secure, Sustainable, and Fair Blockchains*, MEDIUM, (Sept. 25, 2021) <https://medium.com/signum-network/from-proof-of-capacity-poc-to-proof-of-commitment-poc-for-even-more-secure-sustainable-and-d4c61319277d>.

39. M. Edwards, *supra* note 37, at 184.

40. Marc Blinder, *Making Cryptocurrency More Environmentally Sustainable*, HARV. BUS. REV. (Nov. 27, 2018) <https://hbr.org/2018/11/making-cryptocurrency-more-environmentally-sustainable>.

system, in which a plethora of machines are rushing to solve the same problem.⁴¹

Blinder stated that the Delegated Proof of Stake (“DPoS”) system is promising because it is faster and uses less energy.⁴² The DPoS “operates somewhat like a representative democracy. In DPoS systems, everyone who has cryptocurrency tokens can vote on which servers become block producers and manage the blockchain as a whole.”⁴³ However, “the network could be brought to a stop by simultaneous subpoenas or cease and desist orders.”⁴⁴ Sasikumar developed an improved DPoS algorithm based Industrial IoT network “that combines Blockchain and AI for real-time data transmission” which decreases energy consumption and addresses security concerns.⁴⁵

In mid-June 2021, Professor Eswar Prasad of Cornell University echoed Blinder’s sentiment and stated that to conserve Bitcoin server energy, there is a movement away from PoW to PoS.⁴⁶ Activating Ethereum validators on the network with PoS occurs if they can prove that they own Ether (i.e., a “stake” in the ground).⁴⁷ PoS should eliminate the massive computing power required to validate transactions.⁴⁸ By early 2022, Ethereum upgraded its system of validating transactions with a new PoS model called “The Merge” which merges the PoS network with the main Ethereum blockchain.⁴⁹ Developers from around the world met in a hotel to participate. “Mainstream banks like Bank of America and others have ...predicted that The Merge will lead to more mainstream adoption of Ethereum.”⁵⁰

Nassim Nicholas Taleb, scientific advisor to the Universal Investments hedge fund, former derivatives trader, and, author of *Black Swan*,⁵¹ calls

41. Blinder, *supra* note 41.

42. *Id.*

43. *Id.*

44. *Id.*

45. A. Sasikumar, et al., *Sustainable Smart Industry: A Secure and Energy Efficient Consensus Mechanism for Artificial Intelligence Enable Industrial Internet of Things*, 2022 COMPUTATIONAL INTELL. AND NEUROSCIENCE 1 (June 20, 2022) <https://doi.org/10.1155/2022/1419360>

46. Weizhen Tan, *Bitcoin has 3 Flaws - and That Could Set the Stage for Other Alternatives*, says *Cornell Economist*, CNBC, (June 17, 2021, 7:29 PM) <https://www.cnbc.com/2021/06/18/bitcoin-btc-flaws-set-stage-for-alternative-professor.html>.

47. *Id.*

48. *Id.*

49. Taylor Locke, *Merging Toward the Mainstream*, 186 FORTUNE 27, 28 (2022).

50. *Id.*

51. Tyler Cowen, *Nobody Expects the Spanish Inquisition—or Do They? A look at Nassim Taleb’s the Black Swan.*, SLATE, (June 13, 2007 3:37 PM) <https://slate.com/culture/2007/06/what-is-the-black-swan.html>. (Related to innovations, Taleb explains the danger of looking for expected patterns based on past success – everyone expects to see a white swan, but black swans were discovered in Australia.)

Bitcoin a gimmick, ponzi scheme, and a game.⁵² Even so, El Salvador became the first country to adopt Bitcoin⁵³ because many of its citizens do not have bank accounts or credit cards.⁵⁴ However, the rollout did not go well. In a survey by the Central American University, 68% of respondents were opposed to the use of cryptocurrency as money that must be accepted if offered as payment of a debt in El Salvador.⁵⁵

By the end of June of 2021, magnate Salina Pliego, an ally of President Andres Manuel Lopez Obrador's MORENA party, backed the party's bill that would require the Bank of Mexico to purchase foreign money in a bid to assist tourists and migrants repatriate US dollars.⁵⁶ This MORENA party bill would force the central bank to include laundered drug money to its reserves.⁵⁷ To prevent this, the Mexican government announced that use of crypto assets is not legal tender.⁵⁸

"Developing country participation and voice in the rule setting and standards development processes regarding the governance of digital finance is critical."⁵⁹ Perhaps developing countries like El Salvador and Mexico can lead and help create standards so that: 1) banks can better invest in digital currency locally and globally; 2) small cities can offer financial services to more people and become more inclusive; and 3) new, innovative services can be offered. There are two strands of thought: central banks should use their own digital currency to reduce threats from digital currency,⁶⁰ and that central banks should regulate digital currency. The UN advocates that "central banks cannot leave inequality and climate change, for example, to their social development and environmental policy counterparts. . . .Regulating digital currencies . . . should not be too narrowly focused on financial stability and money laundering only."⁶¹ This is contrary to Federal Reserve Chair,

52. Kevin Stankiewicz, *'Black Swan' Author calls Bitcoin a 'Gimmick' and a 'Game,' says it Resembles a Ponzi Scheme*, CNBC, (Apr. 23, 2021, 9:49 AM) <https://www.cnbc.com/2021/04/23/bitcoin-a-gimmick-and-resembles-a-ponzi-scheme-black-swan-author.html>.

53. Joe Tidy, *Fear and Excitement in El Salvador as Bitcoin Becomes Legal Tender*, BBC, (Sept. 7, 2021) <https://www.bbc.com/news/technology-58473260>.

54. Dion Rabouin, *The U.S. is Losing the Global Race to Decide the Future of Money - and It Could Doom the Almighty Dollar*, TIME, (Sept. 21, 2021, 7:00 AM) <https://time.com/6099105/us-china-digital-currency-central-bank/>. See also, Justin Ye, *A Biased Currency, The Ethics of Crypto*, SUMMER HARV. INT'L REV. 18, 19 (2021).

55. Tidy, *supra* note 53.

56. Abraham Gonzalez & Anthony Esposito, *Mexico says Cryptocurrencies are Not Money, Warns of Risks*, REUTERS, (June 28, 2021 4:08 PM) <https://www.reuters.com/world/americas/mexico-says-cryptocurrencies-are-not-money-warns-risks-2021-06-28/>.

57. *Id.*

58. *Id.*

59. People's Money, *supra* note 20, at 70.

60. Ajay S. Mookerjee, *What if Central Bans Issued Digital Currency?*, HARV. BUS. REV. (Oct. 15, 2021) <https://hbr.org/2021/10/what-if-central-banks-issued-digital-currency>.

61. People's Money, *supra* note 20, at 49.

Jerome Powell's aforementioned stance that its focus needs to be on consumer protection and money laundering. The UN also advocates that regulations need to provide for consumer protection and cybersecurity.⁶² In traditional banking, the government must know who you are. However, in cryptocurrency, your identity can be hidden.⁶³ Further, the UN has reported that central banks need to draw Sustainable Development Goals ("SDG") into the regulatory frameworks.⁶⁴

Perhaps due to blockchain computing power, economists could use virtual currency transactions to better know consumer consumption patterns and how to set interest rates quicker in perhaps one day rather than in months. This would allow for better policy, monetary, and control decisions. Papandrea explained how interest rates work and how lower rates spur more spending which may spur economic recovery and inflation.⁶⁵ So, the US Federal Reserve adjusts the Federal Funds Rate.⁶⁶ Digitalization of currency would likely result in more useful data for rate setting.

It is interesting to note that the USA is behind China relative to digital currency. By October 2020, the Bahamas was the first country to introduce digital currency; next were the East Caribbean, Nigeria, and Jamaica.⁶⁷ The Canadian, Chinese, Swedish, and Uruguayan central banks were eagerly considering digital currency offerings and have moved from research to pilot programs.⁶⁸ By 2021, Singapore, South Korea, and 13 other countries were testing pilots.⁶⁹ By 2022, more than 50 countries were in advanced stages.⁷⁰

Citing the PwC CBDC global index, which tracks central bank digital currency CBDC R&D project status, Rabouin stated that the USA is in its research phase, ranking 8th,⁷¹ behind Sweden, South Korea, and China, which are all moving forward with issuing CBDC.⁷² Yet, China is in an implementation phase.⁷³ In the future, existing central

62. *Id.* at 60.

63. Gareth W. Peters, et al., *Trends in Cryptocurrencies and Blockchain Technologies: A Monetary Theory and Regulation Perspective*, 3 J. OF FIN. PERSP. 1, 12 (2015). See Committee on Payments and Market Infrastructures: Markets Committee, *Central Bank Digital Currencies*, BANK FOR INT'L SETTLEMENT 1,6 (Mar. 2018) <https://www.bis.org/cpmi/publ/d174.pdf>

64. People's Money, *supra* note 20 at 64.

65. See Dawn Papandrea, *How Federal Interest Rates Work*, U.S. NEWS, (Dec. 14, 2023, 3:53 PM) <https://money.usnews.com/loans/articles/how-federal-interest-rates-work>.

66. *Id.*

67. See, Edd Gent, *Central Banks Join the Cryptocurrency Gold Rush*, IEEE SPECTRUM (July 22, 2022) <https://spectrum.ieee.org/central-bank-digital-currency>.

68. People's Money, *supra* note 20 at 21.

69. Mookerjee, *supra* note 60.

70. Gent, *supra* note 67.

71. Rabouin, *supra* note 54.

72. *Id.*

73. *Id.*

banks will not have the same role as an entity that does lending; digital currency provides a window into the detailed information about user transactions.⁷⁴

It is also important to note that cryptocurrency has introduced money laundering and fraud risks.⁷⁵ Cryptocurrency seems to turbocharge cybercrimes and demands for cryptocurrency has increased.⁷⁶ An example is the Bitcoin ransom request in the Colonial Pipeline cyberattack.⁷⁷ In late June, a South African Bitcoin Ponzi scheme was discovered.⁷⁸ In Las Vegas, a mother and son team swindled 277 investors out of \$12 million.⁷⁹ In the first week of July of 2021, Kaseya software of a Swedish grocery chain was victim to a cyberattack that may have involved Russian Revil Bitcoin cryptocurrency ransomware.⁸⁰

The Federal Reserve Chair, Powell, met with Coinbase's CEO, Brian Armstrong, to discuss financial risks.⁸¹ Fred Ehrsam, a computer scientist and engineer previously employed as an analyst at Goldman Sachs, and Brian Armstrong founded Coinbase in 2012 to help make cryptocurrency go mainstream, increase customer trust, and gain the trust of regulators.⁸² He states that with cryptocurrency, "you can be your

74. See Kenneth Rogoff, *The Dollar's Fragile Hegemony*, PROJECT SYNDICATE, (May 30, 2021) <https://www.project-syndicate.org/commentary/flexible-renminbi-could-threaten-global-dollar-hegemony-by-kenneth-rogoff-2021-03>; See also Lawrence Wintermeyer, *Could Developing Nations Follow El Salvador's Move to Bitcoin?*, FORBES (April 5, 2021, 5:30 PM) <https://www.forbes.com/sites/lawrencewintermeyer/2021/08/05/could-developing-nations-follow-el-salvadors-move-to-bitcoin/?sh=25395ab628b7> (analyzing how digital currency will break USD dependency. Countries that see the USD as their official currency are essentially outsourcing their monetary policy to the US Federal Reserve. USD dependency also results in a loss national symbol and "can increase inequality through the reduction in purchasing power caused by debasement and gives up seigniorage income that reduces GDP and passes it to the U.S.")

75. People's Money, *supra* note 20, at 41.

76. Vlad-Andrei Rotundu, *Impact of Blockchain Technology: Benefits and Security Risk and Threats*, 26 INFORMATICA ECONOMICA 37,38-39 (Feb. 2022) <http://revistaie.ase.ro/content/102/04-%20rotundu.pdf>.

77. BBC, *Colonial Pipeline Boss Confirms \$4.4m Ransom Payment*, (May 19, 2021) <https://www.bbc.com/news/business-57178503>.

78. See also, Straits Times, *South Africa to Tighten Oversight of Crypto Assets after Series of Crimes*, (June 30, 2021 1:49 PM) <https://www.straitstimes.com/business/banking/south-africa-to-tighten-oversight-of-crypto-assets-after-series-of-scams>.

79. Rob Thubron, *Mother and Son's Alleged \$12 Million Scam Claimed to Use Supercomputers for Crypto Investment*, TECHSPOT, (July 21, 2021) <https://www.techspot.com/news/90499-mother-son-alleged-12-million-scam-claimed-use.html>.

80. Clare Duffy, *A Massive Ransomware Attack Hit Hundreds of Businesses. Here's What We Know*, CNN, (July 7, 2021, 8:20 AM) <https://www.cnn.com/2021/07/06/tech/kaseya-ransomware-what-we-know/index.html>.

81. Jeff Cox, *Fed Chair Powell Met with Coinbase CEO Brian Armstrong in May*, CNBC, (July 2, 2021, 2:55 PM) <https://www.cnbc.com/2021/07/02/fed-chair-powell-met-with-coinbase-ceo-brian-armstrong-in-may.html>.

82. Bloomberg Studio 1.0, *Coinbase Co-Founder Fred Ehrsam*, BLOOMBERG, at 00:12, 00:50, 01:38, 02:25, 04:30 (June 16, 2021 3:00 PM) <https://www.bloomberg.com/news/videos/2021-06-16/>

own bank.”⁸³ Ehram says that it is possible that the US regulators gets cryptocurrency wrong. Ehram advocates that cryptocurrency mining is heavily centralized in China.⁸⁴ There is a need for decentralization so that no single country is in control.⁸⁵ Regarding the energy consumption issue, Ehram is defensive and has stated that “it takes far more energy to protect use of physical assets than digital ones.”⁸⁶

Stablecoins are quickly developing as a type of cryptocurrency for which the value is tied to traditional currencies.⁸⁷ The market for cryptocurrency exceeded \$2 trillion USD in April 2021.⁸⁸ By July, Yellen announced that the government needs to quickly establish a stable coin regulatory framework.⁸⁹

Ethereum is a smart contract platform that gave rise to decentralized applications.⁹⁰ These applications “allow peers to interact directly and remove the need for a company to act as a central clearing house for application interaction.”⁹¹ Decentralized finance (“DeFi”) is a competitive marketplace that houses these applications on exchanges, in lending environments, or are tokenized.⁹² The DeFi movement is trying to construct open source, monetary components into trailblazing, more advance products.⁹³ Hence, DeFi can be viewed as a framework with financial products on an open, publicly available decentralized blockchain for anybody to utilize.⁹⁴ Contrary to banks,⁹⁵ this system does not require government issued identification,⁹⁶ DeFi fans advocates that all significant monetary infrastructure will be supplanted with smart contracts.⁹⁷

Although the lack of transparency over who is making cryptocurrency transactions is a concern, the US authorities recouped \$2.3 million in Bitcoin paid to the cyber criminals that demanded ransomware from Colonial Pipeline by identifying a virtual currency.⁹⁸ So, while

bloomberg-studio-1-0-coinbase-co-founder-fred-ehram-video.

83. *Id.* at 11:43.

84. *Id.* at 17:17-17:42.

85. *Id.*

86. *Id.* at 19:38.

87. Schroeder, *supra* note 24.

88. *Id.*

89. *Id.*

90. Campbell R Harvey, et al., Excerpt of *DeFi and the Future of Finance*, 13 (JOHN WILEY & SONS, 2021).

91. *Id.*

92. *Id.* at 6.

93. *Id.* at 13.

94. *Id.* at 6, 13.

95. *See Id.* at 36.

96. Peters, *supra* note 63, at 12.

97. Harvey, et al., *supra* note 90, at 13.

98. Amanda Macias & Christina Wilkie, *U.S. Recovers \$2.3 Million in Bitcoin Paid in the Colonial Pipeline Ransom*, CNBC, (June 7, 2021, 2:41 PM) <https://www.cnbc.com/2021/06/07/>

anonymous, these platforms are not fool proof.⁹⁹ In fact, “[d]espite the anonymous nature of cryptocurrencies, dozens of cyber-criminals have been caught in the last two years thanks to new techniques able to track their funds around the cryptocurrency blockchain.”¹⁰⁰

Nevertheless, there are critics against and proponents for cryptocurrency. Proponents advocate that cryptocurrency can level the playing field for underdeveloped countries with underdeveloped banking services. For example, Nigeria uses Bitcoin for sending funds to family members as remittance.¹⁰¹ This debate is highly charged with many strengths and weaknesses.

In February 2021, Yellen expressed concern over the possibility of using cryptocurrency for illicit finance.¹⁰² In a Senate Banking Committee hearing, the US SEC Chair, Gary Gensler, testified and referred to cryptocurrency dealings as the ‘Wild West’.¹⁰³ In August 2021, the American Bar Association (“ABA”) held a panel discussion entitled “*Cryptocurrency Law: The Wild West or the Financing of the Future?*” moderated by the ABA’s White Collar Committee Chair and Financial Institution Fraud, Money Laundering and Patriot Act Subcommittee Co-Chair, Michael Leotta.¹⁰⁴ During this panel discussion, Professor David Yermack of New York University’s Stern School of Business Finance Department stated, “I think the U.S. regulatory strategy up to now has been denial, hoping that this will go away.”¹⁰⁵

Further, during his testimony, Gensler stated that he will not approve a Bitcoin Exchange Traded Fund (“ETF”) until there is a regulatory framework for cryptocurrency.¹⁰⁶ At least 6 Bitcoin spot ETF

us-recovers-some-of-the-money-paid-in-the-colonial-pipeline-ransom-officials-say.html.

99. Joe Tidy, *The Fiendish New Trick Cyber-Criminals are Using to Evade Capture*, BBC, (Aug. 12, 2021) <https://www.bbc.com/news/technology-58176113>.

100. *Id.*

101. Lawrence Wintermeyer, *Bitcoin’s Energy Consumption is a Highly Charged Debate - Who’s Right?*, FORBES (Mar. 10, 2021, 6:00 AM) <https://www.forbes.com/sites/lawrencewintermeyer/2021/03/10/bitcoins-energy-consumption-is-a-highly-charged-debate-whos-right/?sh=6dc6d0837e78>.

102. Jeffrey M. Green, *What are the Laws for Cryptocurrency?*, THE BALANCE (June 17, 2022) <https://www.thebalancemoney.com/what-are-the-laws-for-cryptocurrency-5121102>.

103. Sylvan Lane, *Gensler Compares Cryptocurrency Market, Regulations to ‘Wild West’*, THE HILL, (Sept. 1, 2021, 6:42 AM) <https://thehill.com/policy/finance/572278-gensler-compares-cryptocurrency-market-regulations-to-wild-west/>.

104. A.B.A., *It’s Time to Regulate Cryptocurrency - Here’s What’s Brewing* (Aug. 16, 2021) <https://www.americanbar.org/news/abanews/aba-news-archives/2021/08/it-s-time-to-regulate-cryptocurrency---here-s-what-s-brewing/>.

105. *Id.*

106. Akayla Gardner, *SEC’s Gensler Doubles Down on Concerns About Spot Bitcoin ETFs*, BLOOMBERG, (Dec. 3, 2021, 10:19 AM) <https://www.bloomberg.com/news/articles/2021-12-03/sec-s-gensler-doubles-down-on-concerns-about-spot-bitcoin-etfs>.

applications were filed with the SEC.¹⁰⁷ Professor Yermack shared that the United States has fallen behind Switzerland, Singapore, and Ontario which all have ETFs.¹⁰⁸ The Ontario ETF, in particular, is adversely impacting the United States' because it gathers assets that could potentially be in the United States.¹⁰⁹ The United States is also losing innovative companies to other countries due to its slowness in figuring things out and adopting regulations.¹¹⁰ Yet, in December 2021, Gensler responded to Senator Pat Toomey, member of the US Senate Banking Committee, and said although some other countries' regulators approved spot ETFs, Gensler was still concerned about the potential for fraud, manipulation, and lack of regulatory oversight over Bitcoin in the US.¹¹¹

More recently and outside the scope of reviewing publications, in August of 2023, there was a federal court ruling to require the SEC to reconsider its rejection of a Grayscale investment fund's Bitcoin ETF application.¹¹² The applicants were investment funds seeking to list Bitcoin ETFs in a way that enabled investments in Bitcoin without directly owning the token.¹¹³ "A spot Bitcoin ETF would crucially enable investor exposure to the largest digital asset without directly going through an exchange."¹¹⁴ In October of 2023, in a Bloomberg Wallstreet Week interview, Gensler stated that he could not prejudge the 8 to 10 Bitcoin ETF applications before the SEC.¹¹⁵ These exchange trade products have to register with the SEC "similar to going public like an IPO" and require feedback from the SEC's divisions of corporate finance and trading and markets.¹¹⁶ In December of 2023, regulators had advanced to discussing key technical details with these ETF applicants.¹¹⁷ The spot Bitcoin ETFs were approved by the SEC in January of 2024.¹¹⁸

107. Ben Bain & Robert Schmidt, *SEC's Gensler Signals Pathway for a Bitcoin ETF with Tough Rules*, BLOOMBERG, (Aug. 3, 2021, 11:15 AM) <https://www.bloomberg.com/news/articles/2021-08-03/sec-s-gensler-signals-pathway-for-a-bitcoin-etf-with-tough-rules>.

108. A.B.A., *supra* note 104.

109. *Id.*

110. *Id.*

111. Gardner, *supra* note 106.

112. Derek Saul, *When Will a Bitcoin ETF be Available? Regulators are Reportedly Warming to Idea*, FORBES, (Dec. 7, 2023, 9:48 AM) <https://www.forbes.com/sites/dereksaul/2023/12/07/when-will-a-bitcoin-etf-be-available-regulators-are-reportedly-warming-to-idea/?sh=dd1d43148d0f>.

113. *Id.*

114. *Id.*

115. Bloomberg Markets, *Gensler says SEC is Weighing Bitcoin ETF Proposals*, BLOOMBERG 05:05, 05:35, 05:31 – 05:35 (Oct. 18, 2023, 11:13 AM) <https://www.bloomberg.com/news/videos/2023-10-18/gensler-says-sec-is-weighing-bitcoin-etf-proposals-video>.

116. *Id.* at 06:11 – 06:17.

117. Saul, *supra* note 112.

118. Mark T. Uyeda, *Statement Regarding the Commission's Approval of Proposed Rule Changes to List and Trade Shares of Spot Bitcoin Exchange Traded Products*, SEC (Jan. 10, 2024), <https://>

In May of 2022, Bloomberg published a compiled list of US state laws related to digital currency. Most states require that these firms acquire state licenses.¹¹⁹ A few states mentioned cryptocurrency brand names such as Coinbase and Binance.¹²⁰ Similarly, the June 2022 National Conference of State Legislatures (“NCSL”) compiled a list of state legislation in 37 states that includes the 2022 legislative session related to cryptocurrency and digital/ virtual currencies.¹²¹

Also in June of 2022, a report entitled “Terrorism and Cryptocurrency: Industry Perspectives” was published regarding a hearing before the US Congress Subcommittee on Intelligence and Counterterrorism of the US House of Representative’s Committee on Homeland Security.¹²² In September and October of 2022, the US Treasury and FSCOC respectively published cryptocurrency risk reports.¹²³

Sam Bankman-Fried co-founded the FTX exchange in 2019 with Gary Wang.¹²⁴ He also led Alameda Research, a cryptocurrency trading firm trading customer funds that held a large share of a FTX-issued token.¹²⁵ Using customer deposits, the FTX exchange moved billions to Sam’s firm, Alameda.¹²⁶ Once this was revealed in November of 2022, \$4 billion USD in withdrawals from the FTX exchange occurred daily.¹²⁷

www.sec.gov/news/statement/uyeda-statement-spot-bitcoin-011023.

119. See Bloomberg Law, *Cryptocurrency Laws and Regulations by State*, (Jan. 18, 2022) <https://pro.bloomberglaw.com/insights/technology/cryptocurrency-laws-and-regulations-by-state/#a-f>. (Coinbase and Binance maintain money transmitter licenses in AZ, DE, MD, MI, MN, MS and NJ; and Coinbase maintains money services licenses in IA and KY).

120. *Id.*

121. Heather Morton, *Cryptocurrency 2022 Legislation*, NAT’L CONF. OF ST. LEGS, (June 7, 2022) <https://www.ncsl.org/financial-services/cryptocurrency-2022-legislation>.

122. *Terrorism and Cryptocurrency: Industry Perspectives: Hearing before the Subcomm. on Intel. and Counterterrorism of the H.R. Comm. On Homeland Sec.*, 117TH CONG. (2022) (generally citing) <https://www.congress.gov/117/chr/CHRG-117hhr/48616/CHRG-117hhr/48616.pdf>.

123. State News Service, *Brown to Treasury: We Need to Work Together on Crypto Legislation*, (Nov. 30, 2022) <https://www.brown.senate.gov/newsroom/press/release/sherrod-brown-to-treasury-we-need-to-work-together-on-crypto-legislation>.

124. Darreonna Davis, *What Happened to FTX? The Crypto Exchange Fund’s Collapse Explained*, FORBES, (June 2, 2023, 10:35 AM) <https://www.forbes.com/sites/darreonnadavis/2023/06/02/what-happened-to-ftx-the-crypto-exchange-funds-collapse-explained/?sh=434be3fd3cb7>.

125. Korean Times, *FTX Now Says Victim of ‘Unauthorized Transactions’*, (Nov 13, 2022, 11:33 AM) <https://www.koreatimes.co.kr/www/2/common/viewpage.asp?newsIdx=339712&categoryCode=501>.

126. Angus Berwick, *Exclusive: At Least \$1 Billion of Client Funds Missing at Failed Crypto Firm FTX*, REUTERS (Nov. 13, 2022) <https://www.reuters.com/markets/currencies/exclusive-least-1-billion-client-funds-missing-failed-crypto-firm-ftx-sources-2022-11-12/>

127. Allison Morrow, *Here’s What Happened Today in Sam Bankman-Fried’s Trial*, CNN (Oct 30, 2023, 5:19 PM) <https://edition.cnn.com/business/live-news/sbf-crypto-fraud-trial-10-30/index.html?ref=biztoc.com>; See also Sara Dorn, *Sen. Sherrod Brown Urges Janet Yellen to Develop Legislation to Regulate Crypto Industry Following FTX Implosion*, FORBES (Nov 30, 2022) (stating \$5 billion was withdrawn in one day) <https://www.forbes.com/sites/saradorn/2022/11/30/>

After FTX filed for bankruptcy, so did the crypto lender BlockFi.¹²⁸ The FTX exchange collapse reminded Senator Sherrod Brown of past firm failures due to failure of oversight, reckless risk taking, and misconduct.¹²⁹ Secretary Yellen compared the FTX collapse to what happened at Lehman.¹³⁰ There was a falling dominoes effect. Bankrupt cryptocurrency lender BlockFi followed the FTX collapse with efforts to collect about \$680 million USD from Sam Bankman-Fried's bankrupt trading company, Alameda Research.¹³¹ Binance backed out of a FTX deal and cryptocurrencies plunged.¹³² Bitcoin sank 16% in the wake of the FTX collapse.¹³³

Sam Bankman-Fried was arrested in December 2022 for wire fraud, conspiracy to commit money laundering, and other criminal charges.¹³⁴ A criminal trial against Bankman-Fried was scheduled to start in October of 2023.¹³⁵ There have been several SEC enforcement actions since his arrest and in February 2023, the US Senate Banking, Housing and Urban Affairs Committee ("Committee") held a hearing on crypto assets.¹³⁶ At this hearing, the witnesses included Policy Director, Lee Reiners of Duke University's Financial Economics Center; Professor Linda Jeng of Georgetown University's Institute of International Economic Law; and Professor Yesha Yadav of the Vanderbilt University Law School.¹³⁷ During the hearing, Committee members criticized the crypto industry for high fees, consumer risk of financial losses, theft, fraud, hacks, scams, lacking investor protections and oversight, recklessness, fostering criminal behavior like drug running and human trafficking, and for being over leveraged and undercapitalized.¹³⁸ The Committee's

sen-sherrod-brown-urges-janet-yellen-to-develop-legislation-to-regulate-crypto-industry-following-ftx-implosion/?sh=233e1d25d95e

128. Dorn, *supra* note 127.

129. *Id.*

130. *Id.*

131. Steven Church, *BlockFi will Seek \$680 Million from FTX's Alameda, Lawyers says*, BLOOMBERG, (Nov. 29, 2022, 1:02 PM) https://www.bloomberglaw.com/bloomberglawnews/bankruptcy-law/X2P5NCNK000000?bna_news_filter=bankruptcy-law#jcite.

132. Korean Times, *Cryptocurrencies Plunge as Binance Scraps Deals for Rival FTX*, (Nov. 10, 2022, 10:44 AM) (S. Kor.) https://www.koreatimes.co.kr/www/world/2023/12/501_339570.html.

133. Akshay Chinchalkar, *Bitcoin Set for More Losses in Wake of FTX's Collapse if History is a Guide*, BLOOMBERG, (Dec. 1, 2022, 10:27 AM) <https://www.bloomberg.com/news/articles/2022-12-02/bitcoin-set-for-more-losses-in-wake-of-ftx-s-collapse-if-history-is-a-guide>.

134. Davis, *supra* note 124.

135. Karena Phan, *No, Prosecutors Did Not Drop All Charges Against Sam Bankman Fried*, AP NEWS, (Jul. 31, 2023, 12:33 PM) <https://apnews.com/article/fact-check-ftx-charges-bankmanfried-crypto-508764697415>.

136. *Crypto Crash: Why Financial System Safeguards are Needed for Digital Assets: Hearing Before the S. Comm. on Banking, Hous., and Urban Affairs*, 118th Cong. (2023) [hereinafter *Crypto Crash Hearing*] (generally citing) <https://www.banking.senate.gov/hearings/crypto-crash-why-financial-system-safeguards-are-needed-for-digital-assets>

137. *Id.* (generally citing).

138. *Id.* (generally citing).

chairman, Sherrod Brown, stated that a comprehensive framework to regulate crypto products to protect consumers is needed.¹³⁹

The hearing witnesses offered solutions. Professor Reiners urged that cryptocurrencies need to be recognized as securities under a special definition to the federal US securities laws to give the SEC exclusive authority to regulate the crypto industry and protect investors.¹⁴⁰ Reiners also highlighted the need to separate customer assets from firm assets. Professor Jeng stated that there is an urgent need to establish formal federal regulatory oversight using formal rulemaking to update the securities laws rather than the enforcement taken to date which has been inadequate in her expert opinion.¹⁴¹ Professor Yadav recommends a self-regulated regime where cryptocurrency exchanges are tasked with oversight of the market like the stock exchanges within a framework for federal oversight of vetting whether the exchanges have adequate capacity.¹⁴² All three witnesses recommended adequate and transparent risk disclosures and crypto financial literacy education in plain English that laypersons can understand.¹⁴³

Further, during this February 2023 US Senate Banking, Housing and Urban Affairs Committee hearing, Senator Tim Scott stated that the SEC had not taken enforcement actions or provided guidance to thwart an incident like the FTX collapse.¹⁴⁴ Senator Scott also noted that SEC Chairman Gary Gensler did not testify in the hearing.¹⁴⁵ However, the SEC has noted 187 enforcement actions dating back to 2013 on its website.¹⁴⁶ Reiners takes the position that “most cryptocurrencies are securities subject to SEC registration and disclosure requirements [while] some cryptocurrencies like Bitcoin are commodities... [and] cryptocurrency exchanges in the U.S. are presently not regulated at the federal level.”¹⁴⁷ In April 2023, during a US House of Representatives’ Financial Services Committee hearing, Gensler defended the SEC

139. *Id.* (written statement of Sherrod Brown, Chairman).

140. *Id.* at 24. (written testimony of Lee Reiners, Policy Director, of Duke Fin. Econ. Ctr., Duke Univ.)

141. *Id.* at 9 (written testimony of Linda Jeng, Visiting Scholar on Fin. Tech., Adjunct Professor of L., Geo. Inst. of Int’l Econ. L.).

142. *Id.* at 7 (written testimony of Yesha Yadov, Professor of L., Vand. L. Sch.).

143. *Id.* at 6, 25, 28 (written testimony of Reiner); *Id.* at 3, 12 (written testimony of Yesha Yadov); *Id.* at 14-15 (written testimony of Jeng).

144. *Id.* (written statement of Tim Scott, Ranking Member).

145. *Id.* (generally citing)

146. SEC, *Crypto Assets and Cyber Enforcement Actions*, (2023), <https://www.sec.gov/spotlight/cybersecurity-enforcement-actions>.

147. *Crypto Crash Hearing*, *supra* note 136, at 2. (written testimony of Lee Reiners, Policy Director, of Duke Fin. Econ. Ctr., Duke Univ.).

crypto crackdown using enforcement actions.¹⁴⁸ Republican House of Representatives critics argued that “the SEC’s disclosure rules were designed to regulate traditional markets” rather than decentralized digital currency exchanges.¹⁴⁹

In June of 2023, the SEC charged Coinbase for operating as an unregistered national securities exchange, broker and clearing agency.¹⁵⁰ Failing to register with the SEC deprives investors of SEC protections.¹⁵¹ The SEC also sued Binance. Coinbase reported that their second quarter 2023 consumer transaction volume declined 70% compared to second quarter 2022.¹⁵² In December 2022, the US Attorney announced charges against FTX founder Sam Bankman-Fried to include campaign finance violations; conspiracy to defraud the Federal Election Commission; wire fraud; and conspiracy to commit wire fraud, commodities fraud, securities fraud, and money laundering.¹⁵³ In October 2023, Bankman-Fried was found guilty of these charges.¹⁵⁴ Further, in November 2023, the US Department of Justice, Treasury Department and Commodity Futures Trading Commission (“CFTC”) found Changpeng Zhao (well known as “CZ”), founder of the Binance cryptocurrency exchange, guilty of money laundering violations.¹⁵⁵ CZ was found guilty of allowing illicit money laundering activities to occur on the Binance exchange and is to pay a \$50 million dollar fine. Binance was fined \$4.3 billion.¹⁵⁶ “The DOJ said it plans to maintain its aggressive stance against crypto players.”¹⁵⁷ Further, the US SEC accused CZ and Binance of deception, failing to disclose, evading the law and conflicts of interest.¹⁵⁸

148. Christina Wilkie, *Gensler Defends SEC’s Crypto Crackdown in Marathon House Hearing*, CNBC, (Apr. 18, 2023, 6:24 PM) <https://www.cnbc.com/2023/04/18/gensler-defends-crypto-crackdown.html>.

149. *Id.*

150. Press Release, SEC, *SEC Charges Coinbase for Operating as an Unregistered Securities Exchange, Broker, and Clearing Agency*, (June 6, 2023) <https://www.sec.gov/news/press-release/2023-102>

151. *Id.*

152. Will Gendron, *Does Anyone Care About Crypto? Consumer Transaction Volume on Coinbase is Down 70% From Last Year*, BUSINESS INSIDER, (Aug. 5, 2023, 11:32AM) <https://www.businessinsider.com/consumer-transaction-volume-coinbase-earnings-fell-troubling-bad-crypto-trading-2023-8>.

153. Press Release, US DOJ, *United States Attorney Announces Charges Against FTX Founder Samuel Bankman-Fried*, (Dec. 13, 2022) <https://www.justice.gov/usao-sdny/pr/united-states-attorney-announces-charges-against-ftx-founder-samuel-bankman-fried>.

154. James Clayton, *Binance Chief Changpeng Zhao Pleads Guilty to Money Laundering Charges*, BBC, (Nov. 21, 2023) <https://www.bbc.com/news/technology-67492753>.

155. David Gura, *CZ, Founder of Crypto Giant Binance, Pleads Guilty to Money Laundering Violations*, NPR, (Nov. 21, 2023, 4:09 PM) <https://www.npr.org/2023/11/21/1214466415/binance-cz-changpeng-zhao-pleads-guilty-settlement-crypto-doj>.

156. *Id.*

157. *Id.*

158. *Id.*

Yet, the so-called SEC *crypto crackdown* and DOJ criminal charges against Sam Bankman Fried has not stopped FTX. They are now working on a reboot by meeting with investors and considering a likely rebranding.¹⁵⁹ As aforementioned, it became illegal to trade cryptocurrency in Hong Kong, China in 2021.¹⁶⁰ Yet, it is interesting to note that by 2023 China is *crypto cracking open*.¹⁶¹ Its government has issued licenses to the Hashkey and OSL exchanges.¹⁶² The licenses allow these exchanges to trade Bitcoin and Ethereum to retail customers.¹⁶³ This is a significant move in the ongoing trade competition between China and the USA.

These problems are more than just problems in the United States. In November 2022, there was a heated debate in the Canadian House of Commons over proposed cryptocurrency legislation.¹⁶⁴ The Tory leader Pierre Poilievre was accused of bankrupting senior citizens by promoting products like Bitcoin.¹⁶⁵ His critics used fear-mongering and stated that cryptocurrencies are in a dark money system that can be used for money laundering, to fund terrorists and to support gang activity.¹⁶⁶ The European Union reported trying to adopt a broad set of regulations.¹⁶⁷ Also, in December 2022, the South Korean government suspended gaming platform token company WeMade's Wemix coins on four exchanges because investors suffered huge losses.¹⁶⁸ The Digital Asset Exchange Association announced that it would terminate transaction support (i.e. delist) to WeMix because it allegedly gave false information about the number of tokens it had in the market and in

159. Alexander Saeedy, *FTX Begins Talks on Reboot Amid Regulatory Crackdown on Crypto Exchanges: The Failed Crypto Company is in Initial Discussions with Investors About Relaunching its International Exchange*, WALL ST. J., (June 28, 2023, 5:42 PM) <https://www.wsj.com/articles/ftx-begins-talks-on-reboot-as-managers-uncover-past-misconduct-38ad7e3c>.

160. Billy Bambrough, *China Just Made a 'Significant' Game-Changing Move That Could be About to Hit the Price of Bitcoin, Ethereum, BNB, XRP, Cardano, Dogecoin, Tron, Polygon and Solana*, FORBES, (Aug. 5, 2023, 7:45 AM) <https://www.forbes.com/sites/digital-assets/2023/08/05/china-just-made-a-significant-game-changing-move-that-could-be-about-to-hit-the-price-of-bitcoin-ethereum-bnb-xrp-cardano-dogecoin-tron-polygon-and-solana/?sh=6807f5a17699>.

161. *Id.*

162. *Id.*

163. *Id.*

164. John Paul Tasker, *Poilievre Blasted During Commons Debate on Cryptocurrency Legislation*, THE CAN. BROAD. CORP., (Nov. 21, 2022, 12:51 PM) <https://www.cbc.ca/news/politics/poilievre-blasted-cryptocurrency-legislation-1.6659052>.

165. *Id.*

166. *Id.*

167. Lyubov Pronina, *EU Monitoring FTX Collapse with Major Crypto Law in Final Stages*, BLOOMBERG, (Nov. 15, 2022, 8:28 AM) <https://www.bloomberg.com/news/articles/2022-11-15/eu-monitors-ftx-collapse-with-major-crypto-law-in-final-stages>.

168. Korean Times, *Wemade CEO to Take Legal Action Against Looming Delisting of its Crypto Wemix*, (Nov. 25, 2022, 3:10 PM) (S. Kor.) https://www.amp.koreatimes.co.kr/www/tech/2024/03/419_340556.html

circulation.¹⁶⁹ By late November 2022, the South Korean's National Policy Committee of their National Assembly moved fast with deliberating on a bill stating that the South Korean exchanges have an obligation to protect investors by preparing ample reserves and to separately manage digital assets held by investors to prevent misuse of consumer assets by coin exchanges.¹⁷⁰

The U.S. CFTC and SEC are to regulate cryptocurrency. The CFTC regulates cryptocurrency futures trading and spot markets; and the SEC monitors emerging cryptocurrency to make sure they are not modeled and formulated to be securities.¹⁷¹ Following the collapse of FTX, US Senator Sherrod Brown wrote Yellen urging the development of cryptocurrency regulation and surveillance to enhance accountability and transparency responsibilities of cryptocurrency firms.¹⁷² In December 2022, the CFTC urged the US Congress to pass legislation to regulate cryptocurrency.¹⁷³ Legislators and financial industry representatives echoed this sentiment at the Reuters Next Conference in late November 2022.¹⁷⁴ Deciding how to regulate cryptocurrency is a difficult task for lawmakers and federal agencies.¹⁷⁵ The ABA panelists voiced this same concern in 2021. Katherine Dowling, General Counsel of Bitwise Asset Management, stated that old frameworks could not work for cryptocurrency and that this new asset deserves original thought to regulate this technology.¹⁷⁶ Professor Yermack stated that the United States is trying to use old case law which has no relevance to the questions being dealt with related to cryptocurrency.¹⁷⁷ Currently, in the United States, proposed cryptocurrency regulations are based on the 1970 Bank Secrecy Act ("BSA") and the 2001 Patriot Act to deter terrorism and money laundering.¹⁷⁸ Professor Yermack called

169. *Id.*

170. Anna J. Park, *Korea's First Digital Asset Bill Expected to be Passed as Early as Dec.*, KOREAN TIMES, (Nov. 27, 2022, 4:53 PM) (S. Kor.) https://www.koreatimes.co.kr/www/nation/2023/03/602_340645.html

171. Green, *supra* note 102.

172. Dorn, *supra* note 127. State News Service, *supra* note 123.

173. Hannah Lang & Chris Prentice, *U.S. CFTC Head Urges Congress to Act Fast on Crypto Regulation*, REUTERS, (Dec. 1, 2022, 11:32 AM) <https://www.reuters.com/technology/us-cftc-chair-be-questioned-over-ftx-collapse-by-lawmakers-2022-12-01/>

174. Reuters, *After FTX Collapse, Pressure Builds for Tougher Crypto Rules*, (Dec. 2, 2022, 4:55 AM) <https://www.reuters.com/business/finance/after-ftx-collapse-pressure-builds-tougher-crypto-rules-2022-12-02/>.

175. Austin Denean, *Congress Rushes to Investigate, Regulate Cryptocurrency After Collapse of FTX*, THE NAT'L DESK, (Dec. 1, 2022, 4:24 PM) <https://thenationaldesk.com/news/americas-news-now/congress-rushes-to-investigate-regulate-cryptocurrency-after-collapse-of-ftx-sam-bankman-fried-senate-agriculture-committee-hearing-digital-assets-wallets-security-commodity>.

176. A.B.A., *supra* note 104.

177. *Id.*

178. Green, *supra* note 102.

for Congress to develop new regulations all together.¹⁷⁹ In December 2022, US Treasury Secretary Yellen stated that cryptocurrency does not have adequate regulation.¹⁸⁰

This study serves to examine how cryptocurrency mining can be conducted in an environmentally sustainable manner; and whether and in what ways cryptocurrency can replace traditional banking in a manner that fosters sustainable development. There is a need for a cohesive federal strategy on regulation.¹⁸¹ This serves to provide recommendations for what needs to be included in a comprehensive set of regulations.

II. METHOD

This is a literature review of the environmental sustainability of cryptocurrency uses in the banking industry. The Critically Appraised Topic (CAT) method was used. CATs provide a critiqued summary of research evidence that answers a research question. The critique includes statements of the relevance of the research results. Healthcare practitioners use CATs to address research questions that are important to the health and well-being of their research subjects. The five (5) steps in this method include: (1) selecting a focused and answerable question; (2) identifying the best available evidence; (3) critically appraising the evidence for validity and relevance to the practice area; (4) applying the results to professional practice; and (5) evaluating performance.¹⁸²

The research focus in healthcare is on the Population, Intervention, Comparator, and Outcome (“PICO”).¹⁸³ The PICO framework to evaluate the interventions that have been adopted to require sustainable cryptocurrency manufacturing was adapted. The cryptocurrency users are those that are considered. The comparator are the traditional banking and currency models. The outcomes are considered across the cryptocurrency industry in relation to whether outcomes are environmentally sustainable or not.

The focus is on interventions which involve developing and implementing policies, strategic plans, and financial investments that provide for environmental sustainability. The comparator intervention is the continuing use of traditional banking models and currency. The research questions are:

179. A.B.A., *supra* note 104.

180. Dorn, *supra* note 127.

181. A.B.A., *supra* note 104.

182. Gelareh Sadigh, et al., *How to Write a Critically Appraised Topic (CAT)*, 19 ACAD. RADIOL-
OGY 872, 872 (Apr. 2012).

183. *Id.* at 873.

With respect to cryptocurrency, how can cryptocurrency mining be conducted in an environmentally sustainable manner? Can and should cryptocurrency replace traditional banking in a manner that fosters sustainable development? What policies should be included in related cryptocurrency regulations?

In this CAT study, a systematic bibliometric literature review was deployed. Since 1929, bibliometric studies have been used to provide a statistical analysis of trends and scientific gaps.¹⁸⁴ Bibliometrics are useful in the development of science policy and research management.¹⁸⁵

The Cochrane Method is also regarded as the leading systematic review strategy in health research such as clinical trials. Using their Cochrane Handbook for Systematic Reviews, the first step in this systematic review was to develop a protocol which outlined the steps for doing the review based on the Cochrane Method.¹⁸⁶ The protocol involved collecting data, screening against selection criteria, appraising the risk of bias, synthesizing the findings, and interpreting the results. With data collection, the goal is to look for documents that support or do not support the research questions. Relevance to the research questions is the inclusion-exclusion criterion.

Data Sources

In this bibliometric systematic review, phenomenon-specific search keywords were selected using the Cochrane Collaboration recommended PICO strategy. This aids with developing well formulated research questions.¹⁸⁷ The research questions are broken down into concepts which include the research PICO. The setting and population in the research questions for this study are related to cryptocurrency mines and users of cryptocurrency.

P = Populations engaged in cryptocurrency investing, mining and use

I = Interventions such as the use of environmentally sustainable strategies for mining and sustainable development use of cryptocurrency

C = Comparison of analyses of traditional banking and currency models

184. See Wolfgang Glänzel, *Bibliometrics as a Research Field - A Course on Theory and Application of Bibliometric Indicators*, COURSE HANDOUTS (2003). See also, O.J. de Oliveira, et al., *Bibliometric Method for Mapping the State-of-the-Art and Identifying Research Gaps and Trends in Literature: An Essential Instrument to Support the Development of Scientific Projects*, INTECHOPEN (2019).

185. Glänzel, *supra* note 184, at 5.

186. Cochrane Collaboration, *Cochrane Handbook for Systematic Reviews of Intervention* (6.2 Version, 2011).

187. *Id.*

O = Outcomes including strengths and challenges related to environmental sustainability and sustainable development

The goal was to compile a comprehensive list of articles that are related to both cryptocurrency and environmental sustainability by searching terms based on the PICO framework. These parameters were translated into the following general Boolean format that a database could understand: (Population OR synonym1 OR synonym2) AND (Strategies1 OR synonym1 OR synonym2) AND (Outcome1 OR synonym1 OR synonym2). Thus, the initial search for the research questions would utilize the keywords that correspond to the PICO criteria. The Boolean search used to identify full text publications was broadly:

(cryptocurrenc OR coinbase) AND (sustainab*)*

Typically, peer reviewed academic publications are chosen. In this study, the goal is to access what is available to practitioners. So, the types of publications included peer reviewed journal articles, newspapers, and press releases. In this study, the search strategy was conducted in *EBSCO's Management Collection, Academic Search Complete, Business Source Complete, Computer Source, GreenFILE, Library, Information Science & Technology Abstracts with Full Text, Applied Science & Technology Source, Energy & Power Source, Entrepreneurial Studies Source, and Environment Complete* databases. For news, EBSCO's *Newspaper Source Plus, Regional Business News and Web News* databases were searched. These databases were first searched between Jan 1, 2010, and Aug 1, 2021. This search was updated in January 2022 for a 10-year period spanning from January 2013 through December 31, 2022. To record data for the systematic review and meta-analysis, the PRISMA method of transparent reporting was used. PRISMA was used to ensure a high-quality rigorous review.¹⁸⁸

Note that Kher conducted a systematic literature review using Tranfield's search of *Business Source Premier, JSTOR, Proquest, SSRN, Google Scholar* and *Researchgate* with the keywords: *blockchain*, cryptocurrency*, bitcoin*, smart contract*, and initial coin offering**.¹⁸⁹ Kher removed supply chain management articles and summarized 152 articles.¹⁹⁰ Kher sorted references into computer science, economics, entrepreneurship, law, and governance.¹⁹¹ In contrast, this systematic literature review differs because the focus is only on the past 10 years;

188. D. Moher, et al., *Preferred Reporting Items from Systematic Reviews and Meta-Analyses: The PRISMA Statement*, 6 PLoS MEDICINE 1, 1 (2009).

189. Romi Kher, et al., *Blockchain, Bitcoin, and ICOs: A Review and Research Agenda*, 56 SMALL BUS. ECON. 1699, 1704 (2020).

190. *Id.*

191. *Id.*

seek discusses of environmental sustainability and sustainable development; and incorporate findings from grey literature such as news articles and press releases. Thus, this is review of both academic and grey literature.

As required in the method protocols, the search was rerun as a check. There was a total of 37 peer reviewed publications; and 216 news and magazine articles. Twenty-nine (29) duplicates and twenty-three (23) publications that were not relevant to the research questions were eliminated. Two hundred and one (201) publications were selected for inclusion in this study.

III. RESULTS

By 2017, many reports had been written by the European Central Bank, International Monetary Fund (“IMF”), and Bank for International Settlements on the pros and cons of virtual currency such as Bitcoin and digital finance.¹⁹² Cryptocurrencies is one of eight (8) categories of blockchain applications sorted from 140 blockchain applications in the energy sector.¹⁹³ O’Donovan and O’Sullivan noted that cryptocurrencies represent 50% of these applications.¹⁹⁴ Stuermer discusses Bitcoin as a digital artifact.¹⁹⁵ This research team advocates that sustainable development has three components: social, environmental, and digital knowledge.¹⁹⁶ The accumulation of knowledge in and of itself needs to be sustainable and research about digital artifacts as sustainable resources needs to be enhanced.¹⁹⁷

Cryptocurrency’s environmental sustainability has been in the spotlight. Bitcoins are awarded when a distributed network of miners successfully mine, store and record a cryptocurrency in a block.¹⁹⁸ Bitcoin mining is an energy-intensive process because it requires the use of powerful computers around the clock running long, complex math

192. Otilia Manta & Napoleon Pop, *The Virtual Currency and Financial Blockchain Technology. Current Trends in Digital Finance*, 21 FIN. STUD. 45, 45 (2017).

193. Joao Akio Ribeiro Santos Yamaguchi, et al., *Blockchain Technology in Renewable Energy Certificates in Brazil*, 18 BRAZ. ADMIN. REV. 1, 5 (Braz.) (2021).

194. Peter O’Donovan & Dominic T.J. O’Sullivan, *A Systematic Analysis of Real-World Energy Blockchain Initiatives*, 11 FUTURE INTERNET 174, 10 (2019).

195. See Matthias Stuermer, et al., *Digital Sustainability: Basic Conditions for Sustainable Digital Artifacts and Their Ecosystems*, 12 SUSTAINABILITY SCIENCE 247 (2017).

196. See *id.*

197. *Id.* at 260.

198. Hindustan Times, *Bitcoin a Climate Calamity? UN Experts see Sustainable Development in Cryptocurrencies*, (India) (July 18, 2021, 4:25 PM IST) <https://www.hindustantimes.com/world-news/bitcoin-a-climate-calamity-un-experts-see-sustainable-development-in-cryptocurrencies-101626605165317.html>.

algorithms to verify transactions.¹⁹⁹ The high-performance computers are called rigs.²⁰⁰ A single new bitcoin requires the same amount of energy as a typical US family uses in 57 days.²⁰¹ This annual energy consumption is comparable to Sweden's annual use of 135 TWh.²⁰² However, the University of Cambridge estimates that Bitcoin mining consumes more than 178 (TWh) annually.²⁰³ For example, 24 hours a day and seven days a week, Bitfarms run five cryptocurrency mining centers on thousands of small computers, capable of performing trillions of math steps per second to solve the challenging computational problems.²⁰⁴ This is called 'hashing.'²⁰⁵

A. Critics

1. Environmentally Unfriendly

Since sustainability problems have been criticized, digital assets other than cryptocurrencies are being studied by monetary authorities and central banks. These studies may reduce the cryptocurrency market share, exchange value, and use value.²⁰⁶ By December 2013, the People's Bank of China stopped its bank and its employees from engaging in Bitcoin activities.²⁰⁷ Yet, China became the world's largest Bitcoin trading market.²⁰⁸ However, by October 2021, Powerbridge Technologies, a China-based blockchain applications provider, announced a subsidiary for cryptocurrency mining of Bitcoin and Ethereum in Hong Kong.²⁰⁹ They claimed they will use "environmental-friendly, green and sustainable energy" but did not give specifics.²¹⁰ So, mining is still underway.

199. *Id.*

200. Canadian Press, *Valencia Provides Update on EarthRenew Acquisition* (Feb. 8, 2018, 1:10 PM) <https://www.globenewswire.com/news-release/2018/02/08/1336563/0/en/Valencia-Provides-Update-on-EarthRenew-Acquisition.html>.

201. Horn, *supra* note 13.

202. Horn, *supra* note 13.

203. Hindustan Times, *supra* note 198.

204. Giuseppe Valiante, *Bitfarms Still Betting on Quebec Despite Growing Pains in Cryptocurrency Field*, THE CAN. POST, (Nov. 20, 2019) <https://financialpost.com/pmnbusiness-pmn/bitfarms-still-betting-on-quebec-despite-growing-pains-in-cryptocurrency-field>.

205. *Id.*

206. Augustine Barroilhet, *Criptomonedas y Blockchain en la Adolescencia [Cryptocurrencies and Blockchain in Adolescence]*, 25 REVISTA DE DERECHO [J. OF L.] 117, 117 (2022).

207. Pradipta Kumar Sahoo, *Bitcoin as Digital Money: Its Growth and Future Sustainability*, 24 THEORETICAL & APPLIED ECON. 54, 61-62 (2017).

208. *Id.*

209. PR Newswire, *Powerbridge Technologies Launches Cryptocurrency Mining Fleets for Bitcoin and Ethereum in Hong Kong*, (Oct. 8, 2021, 9:15 AM) <https://www.prnewswire.com/news-releases/powerbridge-technologies-establishes-cryptocurrency-mining-fleets-for-bitcoin-and-ethereum-in-hong-kong-301396062.html>.

210. *Id.*

As of September 2014, the central bank of Bangladesh outlawed using virtual currencies including Bitcoin.²¹¹ The central bank of Bolivia declared the use illegal as well.²¹² Sirkarov states that extreme aggressive policy of leading central banks is due to increases in Bitcoin prices and increased interest in it; along with rapid, large-scale increase in money circulation by the US Federal Reserve; and European, Great British, and Japanese central banks.²¹³

In 2015, the Bank of International Settlements (BIS) opined that central banks worldwide needed to act against cryptocurrencies in preventing crypto from undermining public trust in central banks.²¹⁴ Agustin Carstens, BIS Head stated that Bitcoin failed a basic textbook definition of being money since it is an asset rather than currency.²¹⁵ Yet, Sirkarov states that the actual functions of money are to provide a means of trade, value storage and account unit.²¹⁶ Sirkarov applied Ludwig von Mises' regression theorem, "a praxeological analysis of the marginal utility of money," and found that the regression theorem is not denied or contravened by cryptocurrency, rather it has the theoretical basis to turn into money.²¹⁷

When Elon Musk declared that Tesla would no longer accept Bitcoin due to the energy consumption, Bitcoin's prices dropped slightly.²¹⁸ "[W]henever Elon Musk tweeted something about cryptocurrencies, positive or negative, the price would either skyrocket or plummet."²¹⁹ Besides Musk, there are allegedly 'whales' who own a lot of dogecoin and can manipulate the market easily.²²⁰ Sixty-seven percent (67%) of the 129.5 billion dogecoins are owned by the top 100 dogecoin addresses (i.e., wallets).²²¹ Money can be transferred without revealing the owner's

211. Sahoo, *supra* note 207, at 61.

212. *Id.*

213. Vladimir Sirkarov, *Криптовалутата Биткойн Камо Пари – Монетарен Анализ Чрез Регресионната Теорема На Лудвиг Фон Мизес [Bitcoin Cryptocurrency as Money – A Monetary Analysis by Using the Ludwig Von Mises Regression Theorem]*, 4 DIALOGUE 65, 75 (2020).

214. Manta & Pop, *supra* note 192, at 52.

215. Lecture by Agustin Carstens, *Money in the Digital Age: What Role for Central Banks?*, BANK FOR INT'L SETTLEMENTS, at 9 (2018).

216. *See* Sirkarov, *supra* note 213.

217. *Id.* at 65-66.

218. Dawn Allcot, *Tesla Stops Accepting Bitcoin for Purchases, Tesla Stock Drops - How does this Affect your Investments?*, YAHOO FINANCE, (May 14, 2021) <https://finance.yahoo.com/news/tesla-stops-accepting-bitcoin-purchases-161508963.html?>; *see* Hindustan Times, *supra* note 198; *see* Harry Robertson, *supra* note 27.

219. Ben Grubb, *I Sold My Cryptocurrency - and so Should You: Endless Growth is not Sustainable*, THE SUNDAY MORNING HEARLD, (austl.) (May 23, 2021, 12:00 AM) <https://www.smh.com.au/business/markets/i-sold-all-my-cryptocurrency-and-you-should-too-endless-growth-is-not-sustainable-20210522-p57u6u.html>.

220. *Id.*

221. *Id.*

identity due to lack of regulation.²²² In the traditional shareholder market, a large shareholder would have to disclose their interests.²²³

Further, in 2021, there was a very public energy debate between Cathie Wood and Elon Musk.²²⁴ When Musk announced in June 2021 that Tesla would no longer accept Bitcoin payments for the Tesla EVs, Cathie Wood of the ARK fund, repeatedly stated that Bitcoin mining is produced by renewable energy to a great degree.²²⁵ However, Elon Musk is not the only critic.

In November 2021, the South Korean K-pop management agency Hybe partnered with Dunamu, a crypto exchange to create a market stand for the purchase and exchange of non-fungible tokens (“NFTs”) of celebrity photo cards of stars including Justin Bieber and BTS.²²⁶ However, fans have protested about the energy consumption issue.²²⁷ So, the partnership reported that it had not decided on a payment method for the purchasing and selling of the NFTs. Dunamu stated that it is searching for eco-friendly solutions.²²⁸

China’s and Hong Kong’s markets for data centers are “likely to be driven by the increase in the investment in artificial intelligence, blockchain, and quantum computing.”²²⁹ China is among the leaders in blockchain technology, and the Chinese government created a Blockchain Network (BCN) across 100 cities to promote blockchain as a predominant technology for online payments.²³⁰ Yet, China and India have enforced bans on cryptocurrency trading; but plan to launch their own cryptocurrencies.²³¹ Janet Yellen, the former Federal Reserve Chairwoman and US Treasury Secretary, has been critical of cryptocurrency. However, the Federal Reserve is planning the release

222. *Id.*

223. *Id.*

224. See Bernice Napach, *Cathie Wood vs. Elon Musk and the Great Bitcoin Energy Debate*, THINK ADVISOR (June 4, 2021, 3:13 PM) <https://www.thinkadvisor.com/2021/06/04/cathie-wood-vs-elon-musk-and-the-great-bitcoin-energy-debate/>.

225. *Id.*

226. Sohee Kim, *Agency home to Bieber and BTS Plans NFT Trading Empire*, BLOOMBERG, (Nov. 10, 2021, 9:10 PM) <https://www.bloomberg.com/news/articles/2021-11-11/bts-bieber-agency-eyes-nft-empire-with-stars-of-pop-and-sports>.

227. *Id.*

228. *Id.*

229. PR Newswire, *The China and Hong Kong Data Center Market by Revenue Is Expected to Grow at a CAGR of Close to 2% During the Period 2019-2025*, (Sept. 9, 2020, 11:30 PM) <https://www.prnewswire.com/news-releases/the-china-and-hong-kong-data-center-market-by-revenue-is-expected-to-grow-at-a-cagr-of-close-to-2-during-the-period-2019-2025-301126592.html>

230. *Id.*

231. Neer Varshney, *Next Decade Could Belong to Cryptocurrency as Fiat System Crumbles: Deutsche Bank Research*, BENZINGA, (Dec. 6, 2019, 6:26 AM) <https://www.benzinga.com/markets/cryptocurrency/19/12/14944195/next-decade-could-belong-to-cryptocurrency-as-fiat-system-crumbles-deutsche-bank-research>.

of a digital currency.²³² While virtual/ digital currency is not necessarily cryptocurrency, it is certainly a movement into the digital asset space.

With 75% of crypto mining occurring in China, in 2021, researchers found that moving cryptocurrency mining from Venezuela, Libya, Iran or Malaysia to Germany or Denmark is necessary to lower the adverse impact on the environment.²³³ The researchers based this on a study of the Environmental Performance Index (“EPI”), energy price, energy generation method, statutory limitations, legal stipulations, personnel resources, atmospheric temperature, and R&D.²³⁴ The researchers advocate for better awareness policies and regulation; and the recent crack-down on cryptocurrency by China is hope for change.²³⁵

2. Lack of Merchant Adoption

Mass adoption of cryptocurrency is needed. Kabbinale opined that the missing ingredient in widespread adoption is economic sustainability as defined by ease in economic transactions.²³⁶ Slow merchant adoption of using cryptocurrencies to purchase products and services is inconvenient. Current blockchain initiatives are siloed and only encourage innovation within their own communities and technological platforms. A collaborative digital economy that welcomes many forms of innovation must be established.²³⁷ Deutsche Bank is of the opinion that Google, Apple, Facebook and Amazon (“GAFA”) would need to play a role for mass adoption of cryptocurrency to happen.²³⁸

However, note that there is some merchant adoption. For example, as with the Tesla electric vehicle sales that originally accepted cryptocurrency, Palari Development is selling 3D printed housing to California buyers that pay using cryptocurrency or Bitcoin for their deposits.²³⁹

232. PRNewswire, *Gryphon Mining Releases New Op-Ed on Crypto and Clean Energy*, (May 20, 2021) <https://www.proquest.com/wire-feeds/gryphon-mining-releases-new-op-ed-on-crypto-clean/docview/2529399580/se-2?accountid=10477>.

233. Sergio Luis Nández Alonso, et al., *Cryptocurrency Mining from an Economic and Environmental Perspective. Analysis of the Most and Least Sustainable Countries*, 14 ENERGIES 4254, 4 (2021).

234. *Id.*

235. *Id.* at 12.

236. Aniruddh Rao Kabbinale, et al., *Blockchain for Economically Sustainable Wireless Mesh Networks*, 32 CONCURRENCY & COMPUTATION: PRAC. & EXPERIENCE 1, 17 (2019).

237. PR Newswire, *Cryptocurrency Project Eyes Revamping Visa/MasterCard Payments*, (May 7, 2018, 1:30 AM) <https://www.prnewswire.com/news-releases/cryptocurrency-project-eyes-revamping-visamastercard-payments-300643648.html>.

238. Varshney, *supra* note 231.

239. Dominion Post, *First 3D-Printed Housing Community Planned in California Desert*, THE DOMINION POST, Mar. 13, 2021, at A18.

Palari's CEO stated that these buyers are tech-savvy millennials with a passion for sustainability.²⁴⁰

3. Not Labor Intensive

A 2022 economic estimation of Bitcoin mining dubbed it as digital crude rather than digital gold.²⁴¹ In August 2022, the President of Paraguay vetoed a crypto regulation that would recognize cryptocurrency as an industrial activity.²⁴² He stated that he was concerned about the excessive use of electric power for crypto mining and the fact that crypto mining requires low manpower which is not good for Paraguay's economy.²⁴³ With regards to low manpower being problematic, the angel investor Hoard Lindzon shared this sentiment in a 2018 interview. He stated that Bitcoin is a cryptocurrency with a global brand without employees; it is a lean digital platform in comparison to Facebook which needs a lot of employees.²⁴⁴ Citing Castellanos, Coll-Mayor, and Noholt, the Yamaguchi article noted that the "Ethereum blockchain lowers the operational costs of developing a market platform. Thus, prosumers and consumers can enter the market without a big investment."²⁴⁵ As this is a market that is easy to enter and requires little manpower, it is not viewed as a substantial job generator.

4. Crypto Crime

In 2018, Google and Facebook cracked down on bad advertisements for cryptocurrencies and initial coin offerings.²⁴⁶ Unfortunately, as cryptocurrency becomes more popular, web ads for scams and fraudulent schemes increased.²⁴⁷ In January 2018, Facebook banned cryptocurrency

240. *Id.*

241. Benjamin A. Jones, et al., *Economic Estimation of Bitcoin Mining's Climate Damages Demonstrates Closer Resemblance to Digital Crude than Digital Gold*, 12 NATURE SCIENTIFIC REP. 14512 (2022).

242. Global Banking News, *Paraguay's President Vetoes Crypto Regulation Bill*, GLOBAL BANKING NEWS, Aug. 31, 2022.

243. *Id.*

244. Jeff Joseph, *Market Exuberance, the Value of Cryptocurrencies & Faith in Millennials*, MODERN TRADER, at 45, 46 (Apr. 2018).

245. Yamaguchi, et al., *supra* note 193, at 8 (citing. *See also* J. Alejandro F. Castellanos, et al., *Cryptocurrency as Guarantees of Origin: Simulating a Green Certificate Market with the Ethereum Blockchain*, IEEE: INTERNATIONAL CONFERENCE ON SMART ENERGY GRID ENGINEERING 367, 371 (2017)).

246. Susan McFarland, *Fighting 'Bad Ads,' Google Targets Cryptocurrency Advertisements*, UPI TOP NEWS, (Mar. 14, 2018, 8:03 AM) https://www.upi.com/Top_News/World-News/2018/03/14/Fighting-bad-ads-Google-targets-cryptocurrency-advertisements/5771521024861/.

247. *Id.*

ads and speculative financial products.²⁴⁸ However, scammers misspell words such as ‘bitcoin’ to get around the Google and Facebook ad blocks.²⁴⁹ Also in January 2018, Ernst & Young discovered that over \$400 million worth of cryptocurrency had been taken either through cyber-attacks or scams.²⁵⁰

Critics are concerned about cybercrime. This is ironic given that like a bank, “the blockchain ledger’s decentralized nature emphasizes reliability and security as a function of mathematics and computer code, and trust in a central entity, such as a bank is not required.”²⁵¹ An example of nefarious behavior is discussed in Dallyn and Frenzel study of Faircoop and their Faircoin.²⁵² These were postcapitalist ‘commons’ which were designed as alternatives to capitalism.²⁵³ Commons are self-organized collectives of people sharing and governing resources.²⁵⁴ Faircoop was founded in 2014 as a seemingly Robinhood business model where a number of overdrafts at several banks throughout Spain were used to pay for a financial co-op that is independent of banks.²⁵⁵ Faircoin gave this movement scale with the use of cryptocurrency.²⁵⁶ It is also important to note that “activities carried out using blockchain technology are a source of significant security risks” and “[t]he increasing number of people that handle cryptocurrencies, corroborated with their lack of expertise on how this technology works, has been exploited by organized crime groups” resulting in an increase in cryptocurrency fraud.²⁵⁷

5. Crypto Volatility

Besides the need for mainstream adoption of cryptocurrency, there has been market volatility and tech viability concerns. In 2018, there was a media frenzy over market volatility. There was a market correction that signaled maturation in the market. Yet, with respect to viability, finding skilled blockchain developers for ICOs & enterprise blockchain projects was extremely problematic. So, Kingsland University opened

248. *Id.*

249. *Id.*

250. Evelyn Cheng, *Nearly \$400 Million Lost, Stolen from Sales of New Digital Coins*, *Ernst & Young Says*, CNBC, (Jan. 22, 2018, 3:31 PM) <https://www.cnbc.com/2018/01/22/nearly-400-million-lost-stolen-from-sales-of-new-digital-coins.html>.

251. Kher, et al., *supra* note 189, at 1701.

252. Sam Dallyn & Fabian Frenzel, *The Challenge of Building a Scalable Postcapitalist Commons: The Limits of FairCoin as a Commons-Based Cryptocurrency*, 53 *ANTIPODE* 859, 859 (2021).

253. *Id.*

254. *Id.* at 860.

255. *Id.*

256. *Id.* at 860, 869.

257. Rotundu, *supra* note 76, at 38.

an accredited blockchain training program.²⁵⁸ In the US, the current cryptocurrency labor market is hot, but there is a lack of experienced talent.²⁵⁹ Although some view these firms as being low labor companies, the in-demand jobs include artificial intelligence engineers, software engineers, product managers, accountants, and account executives.²⁶⁰

In January 2022, Celsius recognized the need for exemplary leadership and experience, and was celebrated for hiring traditional finance executives as COO and CIO.²⁶¹ In May 2022, Bitcoin, Ethereum, Solana and Terra rapidly declined in value causing apprehension about crypto purchases given the fluctuations and volatility.²⁶² Yet, in May 2022, when the Terra Blockchain folded, Celsius paused swaps, trades and other transfers in its service.²⁶³ Celsius', a high yield backing cryptocurrency product, sustainability was questioned, and this fueled a market sell-off.²⁶⁴ Celsius has the largest single digital wallet holding CEL tokens which was 26.6% of the total supply in circulation.²⁶⁵ Despite the January 2022 addition of leadership, in June 2022, the CEL token slumped 20%.²⁶⁶ Further, in 2021, a researcher developed a model of bankruptcy risk estimation with platforms such as e-Toro in mind.²⁶⁷ Interestingly, in July 2022, the eToro online trading platform in Israel which allows users

258. PR Newswire, *Kingsland School of Blockchain Announced as Official Education Partner of Crypto Invest Summit, Los Angeles*, (Oct. 18, 2018, 8:44 AM) <https://www.prnewswire.com/news-releases/kingsland-school-of-blockchain-announced-as-official-education-partner-of-crypto-invest-summit-los-angeles-300733596.html>.

259. Jack Kelly, *Cryptocurrency Companies are Waging a War for Talent in a Hot Job Market*, FORBES, (June 26, 2021, 1:19 PM) <https://www.forbes.com/sites/jackkelly/2021/06/26/cryptocurrency-companies-waging-a-war-for-talent-in-a-hot-job-market/?sh=3eab320f6b19>.

260. Morgan Smith, *These are the 5 Most In-Demand Cryptocurrency Jobs Right Now, According to Monster*, CNBC, (Aug. 10, 2021, 9:00 AM) <https://www.cnbc.com/2021/08/10/these-are-the-5-most-in-demand-cryptocurrency-jobs-right-now-.html>.

261. PR Newswire, *Celsius Announces the Appointment of Traditional Finance Executives Aslihan Denizkurd & Frank van Etten*, (Jan. 14, 2022, 9:30 AM) <https://www.prnewswire.com/news-releases/celsius-announces-the-appointment-of-traditional-finance-executives-aslihan-denizkurdu--frank-van-etten-301461260.html>

262. PR Newswire, *Big Eyes Coin: A Meme Coin that Incorporates Sustainability*, (Sept. 2, 2022, 3:26 PM) <https://www.prnewswire.com/news-releases/big-eyes-coin-a-meme-coin-that-incorporates-sustainability-301617272.html>.

263. Suvashree Ghosh & Sidhartha Shukla, *Crypto Lender Celsius Freezes Withdrawals, Fuels Market Rout*, BLOOMBERG, (June 13, 2022, 11:12 AM). See Vildana Hajric, *'Bear-Market Blues' Test Mettle of Most Devout Bitcoin Holders*, BLOOMBERG, (June 13, 2022, 6:57 PM) <https://www.bloomberg.com/news/articles/2022-06-13/-bear-market-blues-tests-mettle-of-most-devout-bitcoin-holders?embedded-checkout=true>.

264. Ghosh & Shukla, *supra* note 263.

265. *Id.*

266. Muyao Shen, *Crypto Lender Celsius's Token Falls 20% as Terra Concerns Linger*, BLOOMBERG, (June 10, 2022, 9:10 AM) <https://www.bloomberg.com/news/articles/2022-06-10/crypto-lender-celsius-s-token-falls-amid-lingering-terra-concern?embedded-checkout=true>.

267. Moțoc Mădălin-Mihai, *Estimation of Bankruptcy Risk Based on Audit Opinions: Case Study in Romania*, 20 ACTA SCI. POL. OECONOMIA 33, 33 (2021).

to invest in cryptocurrencies, stocks and commodities announced it would lay off 6% of its workers due to market conditions.²⁶⁸ They hope the reduced workforce will enable them to sustain in the long term.²⁶⁹

In February 2022, the Australian bitcoin miner Iris Energy was applauded for powering its sites with renewable energy in Canada.²⁷⁰ In February 2022, Iris Energy claimed to pique the interest of government linked organizations such as offshore sovereign wealth funds that were interested in procuring green sustainable bitcoin.²⁷¹ Although from November 2021 to February 2022, the price of Bitcoin slid drastically, the CEO of Iris Energy stated that the price movements weren't hugely concerning for Iris because it reinvested its mining revenues into buying more miners and increasing their overall output.²⁷² As Bitcoin continued to plummet, perhaps due to rising interest rates and inflationary pressures felt by tech companies, in May 2022, the CEO stated that Bitcoin could drop as low as \$12,770 USD and would still be profitable.²⁷³ Yet, by November 2022, Iris Energy defaulted on its debts after losing 94% of its market share.²⁷⁴ They faced the prospect of lenders taking back their crypto mining equipment.²⁷⁵

By December 2022, cryptocurrency prices fell when the FTX major derivatives exchange went bankrupt.²⁷⁶ Administrators discovered that 3.1 billion in USD is owed to FTX's top creditors.²⁷⁷ In response, by December 2022, the International Swaps and Derivatives Association ("ISDA") began work on a standardization document for the over-the-counter crypto market.²⁷⁸ The catastrophic implosion of the FTX

268. Ofir Dor, *Israeli co eToro Sheds 6% of Workforce*, GLOBES (Isr.) (July 5, 2022, 5:23 PM) <https://en.globes.co.il/en/article-israeli-co-etoro-shedding-6-of-workforce-1001417146>.

269. *Id.*

270. Dominic Powell, *Aussie Crypto Miner Says Sovereign Funds are Eyeing Off Bitcoin*, THE AGE, (Austl.) (Feb. 10, 2022, 3:03 PM). <https://www.theage.com.au/business/companies/aussie-crypto-miner-says-sovereign-wealth-funds-are-eyeing-off-bitcoin-20220210-p59vf9.html>

271. *Id.*

272. *Id.*

273. Dominic Powell, *'Pretty Compelling': Aussie Bitcoin Miner Unfazed over Plummeting Crypto Markets*, THE AGE, (Austl.) (May 12, 2022, 3:07 PM) <https://www.theage.com.au/business/companies/pretty-compelling-aussie-bitcoin-miner-unfazed-over-plummeting-crypto-markets-20220512-p5akr6.html>

274. Colin Kruger & Dominic Powell, *Green Aussie Bitcoin Miner in Peril as Lenders Call in Debts*, THE AGE, (Austl.) (Nov. 23, 2022, 5:14 PM) <https://www.theage.com.au/business/companies/green-aussie-bitcoin-miner-in-peril-as-lenders-call-in-debts-20221122-p5c0fg.html>

275. *Id.*

276. Steven Zeitchik, *FTX Says It Owes More Than \$3 Billion To Creditors*, WASHINGTON POST (Nov. 20, 2022, 3:27 PM) <https://www.washingtonpost.com/business/2022/11/20/ftx-crypto-bankruptcy-creditors/>

277. *Id.*

278. Radi Khasawneh, *ISDA Renews Commitment to Crypto Market OTC Standards*, GLOBAL INVESTOR, (Dec 5, 2022).

exchange is evidence of the need for clearer regulatory oversight.²⁷⁹ Blackrock's CEO Larry Fink stated that "most crypto companies will probably fold in the wake of FTX's collapse."²⁸⁰ Similarly, in September 2022, Mike Novogratz, the billionaire founder of Galaxy Digital Holdings stated that "many crypto hedge funds won't survive 2022's rout in virtual coins;" and Do Kwon's Terraform Labs (Terra blockchain) project's tragic failure served as a lesson for the crypto sector.²⁸¹ There were US and South Korean investigations after the collapse of the TerraUSD stablecoin resulting in an implosion including frozen deposits, bankruptcy, liquidation, a flurry of legal actions and fraud accusations.²⁸² The South Korean government froze \$67 million of Bitcoin tied to Kwon.²⁸³

Bitcoin has been on a volatile roller coaster ride. In 2017, Bitcoin experienced a surge.²⁸⁴ By April 2018, there was a 50 percent plunge in its value.²⁸⁵ But, even with prices plunging, new funds kept cropping up "as optimists bet on the transformative nature of blockchain."²⁸⁶ In December 2020, Bitcoin had a price surge and reached \$20,000 USD and continued to rise.²⁸⁷ In January 2021, Bitcoin slumped below \$30,000 from 42,000.²⁸⁸ Then there was a sharp selloff which stoked concerns

279. *Id.*

280. Annie Massa & Gregory Korte, *BlackRock's Fink Says Most Crypto Firms will Fold Following FTX's Implosion*, BLOOMBERG, (Nov. 30, 2022, 10:54 AM) <https://www.bloomberg.com/news/articles/2022-11-30/fink-says-most-crypto-firms-will-die-off-following-ftx-implosion> (It is also interesting to note that BlackRock invested 24 million in FTX and could not speculate on whether it was misled until there are more facts. It's leader Larry Fink opined that FTX collapsed due to mismanagement and bad behavior.) *See also* Stephen Gandel, *Deal Book Summit: World Leaders, Business Titans and Crypto's Fallen Star: Larry Fink says FTX Collapse may have Involved 'Misbehavior of Major Consequence'*, NY TIMES, (Dec. 1, 2022) <https://www.nytimes.com/live/2022/11/30/business/dealbook-summit-conference/larry-fink-says-ftx-collapse-may-have-involved-misbehavior-of-major-consequence?smid=url-share>.

281. Joanna Ossinger, *Mike Novogratz Says More Resilient After Forced Seller Exodus*, BLOOMBERG, (Sept. 28, 2022, 2:52 AM) <https://www.bloomberg.com/news/articles/2022-09-28/galaxy-s-novogratz-says-not-many-forced-sellers-left-in-crypto?embedded-checkout=true>

282. Joanna Ossinger, *Crypto Hedge Fund Focused on ESG Buys Algorand, Polkadot*, BLOOMBERG (Oct. 4, 2022, 5:01 PM) <https://www.bloomberg.com/news/articles/2022-10-04/crypto-hedge-fund-buys-algorand-algo-polkadot-dot-cosmos-atom>.

283. Sangmi Cha & Tanzeel Akhtar, *South Korea Moves to Million to Bitcoin Tied to Kwon*, BLOOMBERG, (Sept. 27, 2022, 8:40 AM) <https://www.bloomberg.com/news/articles/2022-09-27/south-korea-seeks-to-freeze-bitcoin-btc-linked-to-do-kwon>.

284. *See* Olga Kharif, *Crypto Hedge-Fund Bubble Begins to Deflate*, BLOOMBERG, (Apr. 2, 2018, 8:44 AM) <https://www.bloomberg.com/news/articles/2018-04-02/crypto-hedge-fund-bubble-begins-to-deflate-as-returns-tumble?embedded-checkout=true>.

285. *Id.*

286. *Id.*

287. Dominic Powell, *Fund Managers Steer Clear of Bitcoin Despite Price Surge*, THE AGE, (Austl.) (Dec. 17, 2020, 3:59 PM) <https://www.theage.com.au/business/markets/fund-managers-steer-clear-of-bitcoin-despite-surging-prices-20201217-p56odt.html>

288. Eric Lam, *Bitcoin's Volatile Week Rattles Faith in Crypto Resurgence*, BLOOMBERG (Jan. 22, 2021, 9:59 AM) <https://www.bloomberg.com/news/articles/2021-01-21/bitcoin->

about the potential longevity of the cryptocurrency surge.²⁸⁹ Then Bitcoin steadied at \$32,000.²⁹⁰ In the third quarter of 2021, after Chair Powell said he would not ban cryptocurrency, Bitcoin peaked.²⁹¹ By March 2022, Bitcoin jumped above \$41,000.²⁹² Bitcoin “fluctuates with diverse patterns according to economic and regulatory changes.”²⁹³ Yet, by June 2022, Bitcoin was in the throes of its worst slide.²⁹⁴ Bitcoin is not the only coin experiencing this type of volatility. By 2019, the 9th largest coin Stellar Lumens’ bullish momentum began to fade away.²⁹⁵

Yet, despite this shakeout in digital assets, the crypto hedge fund Modular Asset Management (“MAM”) bought Algorand and Polkadot tokens betting that coins with strong sustainability characteristics could survive in the long term and their environmental, social, and governance (“ESG”) strategies take time to pay off.²⁹⁶ When making a purchase, MAM considers 25 ESG metrics of the blockchain or smart-contract platform.²⁹⁷ Their criteria include energy use, shifts in wallet wealth distribution, the composition of validators on the network, and whether validators aid in putting transactions in the right order on a blockchain to ensure smooth operations.²⁹⁸

While the Caisse de Depot et Placement du Quebec (“CDPQ”) Montreal’s officials declared cryptocurrency to be an illogical, roulette wheel casino investment, they find the cryptocurrency-related blockchain technology an attractive investment.²⁹⁹ It is also important to note that in the 2022 ESG Special Report on Trends in Investing, cryptocurrency is noted to be of low interest to financial planners and they are critical of it.³⁰⁰ Further, in November 2022, Whealthcare Planning’s

drops-close-to-30-000-mark-as-head-turning-rally-stalls?embedded-checkout=true.

289. *Id.*

290. *Id.*

291. See Vildana Hajric & Cecile Gutscher, *Bitcoin Biggest Jump Since July Leaves Traders Speculating Why*, BLOOMBERG (Oct. 1, 2022, 9:45 AM) <https://www.bloomberg.com/news/articles/2021-10-01/bitcoin-jumps-amid-renewed-optimism-about-regulatory-pressure>.

292. Sidhartha Shukla & Crystal Kim, *Bitcoin Jumps to \$41,000 While Breaking out of Trading Range*, BLOOMBERG (Mar. 16, 2022, 7:50 PM)

293. Wei Sun, et al., *Spatial Analysis of Global Bitcoin Mining*, 12 NATURE SCIENTIFIC REP. 1, 5 (2022).

294. Hajric, *supra* note 263.

295. Tanya Abrosimova, *Stellar Lumens Bullish Momentum Is Fading Away*, BENZINGA, (Mar. 13, 2019).

296. Ossinger, *supra* note 282.

297. *Id.*

298. *Id.*

299. Rick Baert, *CDPQ CEO Touts Light Rail as a Return Generator*, PENSIONS & INVESTMENTS, (Jan. 21, 2019, 12:00 AM) <https://www.pionline.com/article/20190121/PRINT/190129986/cdpq-ceo-touts-light-rail-as-a-return-generator>

300. Danielle Andrus & Bridger Cummings, *2022 Trends in Investing: June 2022*, FIN. PLAN. ASS’N (June 2022) <https://www.financialplanningassociation.org/learning/publications/journal/JUN22-2022-trends-investing-OPEN>.

founder Dr. Chris Heye was critical of cryptocurrency as a trend in wealth management summarizing that: 1) it may worsen income disparities because most related venture funding and salaries are going to the already rich crypto executives; 2) cryptocurrency mining is energy intensive and contribute to CO2 emissions; and 3) there is no evidence of cryptocurrency providing democratization of the financial services sector to the extent that it provides a solution to lack of access to quality medical care or alleviation of global poverty.³⁰¹

B. *Proponents*

1. Transparency Improves Environmental Stewardship

In 2013, the US government began to levy taxes on Bitcoin enterprises and the US Treasury classified Bitcoin as a decentralized convertible virtual form of money.³⁰² By 2013, the Bank of Australia had no law against the use of Bitcoin.³⁰³ The Australian tax office declares Bitcoin ownership a property asset to be taxed for capital gain purposes.³⁰⁴ In 2014, the Central Bank of Iceland announced a legal designation for digital currency that would safeguard the Icelandic currency. In addition, Iceland did not ban all cryptocurrencies and Icelanders use the Auroacoin.³⁰⁵

Relative to environmental sustainability, the United Nations has reported that cryptocurrencies can improve environmental stewardship because of the heightened transparency it affords.³⁰⁶ For example, the technology has been used for regulatory enforcement to eliminate illegal tuna fishing.³⁰⁷ It can be used to show how countries are taking action to reduce their impact on the environment.³⁰⁸ The UN is hopeful that crypto players will switch to different methods to verify transactions.³⁰⁹

301. Chris Heye, *The Three Most Important Trends in Wealth Management*, (Nov. 2022), <https://www.financialplanningassociation.org/learning/publications/journal/NOV22-three-most-important-trends-wealth-management>

302. Sahoo, *supra* note 207, at 62.

303. *Id.* at 63.

304. *Id.* at 63.

305. Sahoo, *supra* note 207, at 62. *See also* Elin Hofverberg, *Iceland: National Digital Currency Auroracoin Launched*, GLOB. LEGAL MONITOR LIBR. OF CONG., (2014) <https://www.loc.gov/item/global-legal-monitor/2014-08-12/iceland-national-digital-currency-auroracoin-launched/>

306. Hindustan Times, *supra* note 198.

307. *Id.*

308. *Id.*

309. Hindustan Times, *supra* note 198. regarding blockchain investments to enable digital ad green transformation). *See also* Angus Melville, *Report Launched on AI and Blockchain*, TRADE FINANCE (June 21, 2021) (discussing the European Investment Bank & European Commission's research report entitled *Artificial Intelligence, Blockchain and the Future of Europe: How Disruptive Technologies Create Opportunities for a Green and Digital Economy*).

Transparency can also thwart Greenwashing. Manta reported that the largest financial institutions including Bank of America, Citi Bank, Deutsche and Goldman Sachs have been exploring possibilities of partnering to use a blockchain transaction register.³¹⁰ Mushtaq Kapasi, Chief Representative for Asia Pacific at the International Capital Market Association, claimed that finding data on sustainable finance products for internal management and regulatory compliance reporting, is a major data difficulty.³¹¹ According to Jacob Michaelsen, Head of Sustainable Finance Advising at Nordea, issues are required to write impact reports and investors need them.³¹²

There is a need to improve data transparency. To this end, in 2021 Deutsche Bank collaborated with a Singapore fintech company STACS to create a proof of concept to strengthen digital bonds with sustainability themes.³¹³ They are investigating how distributed ledger technology may improve transparency and stop greenwashing in primary issuances.³¹⁴ They also want to support the management of ESG actions.³¹⁵ In addition, one goal for the HKbitEX is to grade each digital asset on their exchange for cross-border products on ESG criteria. Transparency and data privacy issues go hand in hand.³¹⁶ So, cross border data privacy laws come into play.³¹⁷ Also, in April 2021, Deutsche's Boerse crypto exchange was reportedly delivering phenomenal growth in crypto and planned to widen its offering linked to ESG values.³¹⁸

2. Use of Renewable Energy in Crypto Mining

Another way to reduce the carbon footprint is by using renewable energy to power cryptocurrency mining. As aforementioned, Cathie Woods of Ark debated with Elon Musk and pointed out that many crypto miners use renewable energy.³¹⁹ The Hyperscale data center market fueled by investments in colocation and cloud service providers is anticipated to expand faster than a 2% Compound Annual Growth

310. Manta & Pop, *supra* note 192, at 50.

311. Karry Lai, *How Blockchain can Help Drive Sustainable Finance*, 64 INT'L FIN. L. REV. 1 (2021).

312. *Id.*

313. *Id.*

314. *Id.*

315. *Id.*

316. *Id.*

317. *Id.*

318. Wendy Lisney, *Deutsche Boerse Sees 'Phenomenal growth' in Crypto*, GLOB. INV., (Apr 12, 2021).

319. Massar, *supra* 28.

Rate (“CAGR”) until 2025.³²⁰ This includes cryptocurrency facilities.³²¹ Service operators are adopting diesel systems and innovative gas and bi-fuel systems.³²² For example, gas systems can be deployed in parallel with the electricity grid’s power supply to cut down on data centers’ use of electricity.³²³ These environmentally friendly, economically advantageous alternatives to diesel can be used in facilities that are built in places located closer to natural gas production areas.³²⁴

DMG Blockchain Solutions states that it is ecologically conscious and has non-polluting data center operations by using mining powered by renewable energy.³²⁵ In addition, China is experiencing a lot of need for cryptocurrency and blockchain data centers.³²⁶ China’s use of renewable energy to reduce electricity costs; water-based cooling; low-cost greenfield data center construction; and submarine cable deployments to connect China is increasing the high-performance data center market demand.³²⁷

In a project called Harvest, engineer Julian Oliver in Berlin uses a 2-meter wind turbine to power a computer to mine cryptocurrency.³²⁸ The wind turbine puts out 700 watts of power at 24 volt and he uses the mined cryptocurrency to fund climate change research.³²⁹ Also, Gryphon Digital Mining has a long-term objective to crypto mine with a 100% renewable energy supply; it has secured 90 MW of mining capacity.³³⁰

Similarly, Bitfarms makes use of Sherbrooke Quebec’s hydroelectricity to help power its Bitcoin digital operations in Quebec.³³¹ The town allows Bitfarms to use 98MWs for \$3 million a year from Bitfarms.³³² However, noise comes from large ventilators that keep the factories cool.³³³ Bitfarms proposed to build a 23-meter-tall wall as a sound

320. PR Newswire, *supra* note 229.

321. *Id.*

322. *Id.*

323. *Id.*

324. *Id.*

325. Canadian Press, *SYMBOL:TSX VENTURE:DMGI, OTCDMGGF, FRANKFURT:6AX*, (May 12, 2021).

326. *See* PR Newswire, *supra* note 229.

327. *Id.*

328. Philippines Daily Inquirer, *Wind power, Cryptocurrency in a Combo that Funds Climate Change Research*, (Sept. 17, 2017).

329. *Id.*

330. PR Newswire, *Gryphon Digital Mining Has Signed Crypto Climate Accord*, (May 17, 2021) <https://www.proquest.com/wire-feeds/gryphon-digital-mining-has-signed-crypto-climate/docview/2528274839/se-2?accountid=10477>. *See* PR Newswire, *Gryphon Digital Mining CEO Speaks on Cheddar TV’s ‘Crypto Craze’* (June 14, 2021, 7:00 AM) <https://www.prweb.com/releases/gryphon-digital-mining-ceo-speaks-on-cheddar-tv-s-crypto-craze--817871583.html>.

331. Valiante, *supra* note 204.

332. *Id.*

333. *Id.*

barrier.³³⁴ Bitfarms is a benefactor of China's ban on crypto mining.³³⁵ After the Sichuan and Yunnan provinces ordered all miners to depart, the miners scouted for places to relocate.³³⁶ In 2019, economist Alex de Vries estimated that China accounted for 75% of Bitcoin mining.³³⁷ The US miners increased and now have less competition.³³⁸ "China's decision to ban Bitcoin mining was driven primarily by Beijing's desire to curb cryptocurrency transactions outside the banking system."³³⁹ Note that the Cambridge Center for Alternative Finance reported that China accounts for over 70%.³⁴⁰

Also note that Genesis Mining in Iceland enables mining for Bitcoin and Ethereum on the web and uses renewable energy.³⁴¹ In addition, EarthRenew uses a natural gas fired turbine to produce low-cost electricity at a Strathmore Alberta plant.³⁴² The company uses the electricity for crypto mining as well as thermally drying manure and turning it into fertilizer.³⁴³

In 2016, EDRCoin claimed to leave no carbon footprint by using solar panels' energy at independent private farms.³⁴⁴ They also give back by donating 7% of their income to recover mangrove forests in Asia and the development of new solar powered plants. EDRCoin uses a PoS consensus system.³⁴⁵ In 2018, Heisenberg Capital's founder Max Keiser stated that early on, they predicted that crypto mining would be dependent on renewable energy such as solar energy. They support projects in the solar energy sector with a cryptocurrency based crowdfunding platform.³⁴⁶ Just as Elon Musk once accepted cryptocurrency for Tesla electric vehicles, the Sun Exchange in Africa is a blockchain solar panel micro-leasing marketplace that allows customers to lease solar panels with cryptocurrency. The UN selected them to pilot blockchain based solar financing in Moldova. Sun Exchange was launched on Max Keiser's cryptocurrency-based crowdfunding platform StartJoin and launched its own token, SUNEX.³⁴⁷

334. *Id.*

335. Tully, *supra* note 35, at 78.

336. *Id.*

337. *Id.*

338. *Id.*

339. *Id.* at 79.

340. CGTN, *supra* note 26.

341. Blinder, *supra* note 40.

342. Canadian Press, *supra* note 200.

343. *Id.*

344. M2PressWire, The New Cryptocurrency EDRCoin Strives to Change the World for Better, (Apr. 11, 2016), <http://www.pressreleasejet.com/news/the-new-cryptocurrency-edrcoin-strives-to-change-the-world-for-better.html>

345. *Id.*

346. Global Newswire, *GNW-en-00-MIS-MIS-MIS*, CANADIAN PRESS, (May 30, 2018)

347. *Id.*

Also in 2018, Solar Alliance hired the celebrity actor William Shatner to help it market bitcoin miner rental space in a warehouse in Illinois that is powered with a 3MW solar panel array. Shatner was a crypto critic but changed his stance to be a part of this renewable energy solution. The problem with this business model is that miners request 20 to 100 MW according to the managing director of the Chelan County Public Utility District.³⁴⁸ Further, in Africa, Water Pure International initiated a solar farm project for crypto mining. CleanSpark's goal is to make Bitcoin mining environmentally sustainable with renewable energy investments for 95% carbon free mining.³⁴⁹

With regards to investor funding, ethical clothing advocate Samantha Jones developed an app to tell consumers where and how their clothes are manufactured as an act of social responsibility to bring transparency to environmental issues and clothing factories' labor and other exploitations.³⁵⁰ Jones was able to get 1.2 million in funding from the NEM Community Fund which funds via cryptocurrency and a blockchain platform.³⁵¹

Cambridge University researchers reported that 62% of cryptocurrency miners rely on hydropower for at least some of their electricity; and 38% use some coal.³⁵² Bitcoin advocates argue that all industries use a lot of energy, and it is unfair to single out bitcoin.³⁵³ In May 2021, Rob Chang and Brittany Kaiser of Gryphon Digital Mining wrote an op-ed to counterattack Elon Musk's outcry against crypto mining's energy consumption.³⁵⁴ They claim that they use 100% renewable energy, and the industry is focusing on doing this.³⁵⁵ Chang and Kaiser argued that the energy costs involved in managing the US dollar has not been published by the Federal Reserve; nor how they plan to seek to manage the proposed US blockchain based digital dollar scheduled to be implemented the Summer of 2021.³⁵⁶ These Gryphon mining representatives argued that when 5 billion viewers watched the Despacito viral

348. Brian Fung, *Shatner Finds a Enterprise*, THE SOUTHLAND TIMES, (June 16, 2018) <https://www.pressreader.com/new-zealand/the-southland-times/20180616/281883004052460>

349. Jacqueline Mumford, *CleanSpark Wants to Make Bitcoin Mining Sustainable*, UTAH BUS., (2021) <https://www.utahbusiness.com/bitcoin-mining-rigs-in-utah/>

350. Chloe Winter, *Sweatshop or Sustainable? Check the App*, MANAWATU STANDARD, (July 19, 2018).

351. *Id.*

352. Amanda Shendruk & Tim McDonnell, *How Much Energy Does Bitcoin Use?*, QUARTZ, (June 26, 2021) <https://qz.com/2023032/how-much-energy-does-bitcoin-use>

353. *Id.*

354. Rob Chang & Brittany Kaiser, *Elon Musk: Crypto Leaders Need to Ensure the Bitcoin Boom is Sustainable*, BENZINGA, (May 15, 2021) <https://www.benzinga.com/markets/cryptocurrency/21/05/21133786/elon-musk-crypto-leaders-need-to-ensure-the-bitcoin-boom-is-sustainable>

355. *Id.*

356. *Id.*

music video, the energy utilized by computer hardware equaled that of 40,000 residential dwellings in a year.³⁵⁷ They argue that critics need to compare crypto-mining energy consumption to other digital use. They cite a Cambridge University study that claims Bitcoin's consumption of non-renewable energy is roughly 78.7 TWh.³⁵⁸ This equates to 61 billion pounds of burned coal, the electricity needed to power 9 million houses, or to travel 138 billion miles in an average passenger car.³⁵⁹

Some companies claim they have carbon-neutral platforms. In November 2018, the cryptocurrency company Bitpay partnered with the Paxos token PAX, a stable coin cryptocurrency backed 1 to 1 with the US dollar for blockchain payment processing.³⁶⁰ In October 2022, Bitpay added Polygon to expand its crypto payment options.³⁶¹ Polygon is an Ethereum scaling platform with payments being a “frictionless and carbon-neutral Layer-2 Ethereum scaling platform.”³⁶² In October 2022, Polygon invested in the Singapore based Venture Capital Fund called Blockchain Founders Fund (BFF).³⁶³ This fund raised 75 million in USD from leading crypto investors and supports over 100 Web3 space companies to help them scale.³⁶⁴ Web3 is “a vision of a decentralized internet built around blockchains, crypto's underlying technology.”³⁶⁵

Unfortunately, some cryptocurrency companies are claiming to be eco-friendly but do not state the methods they are using. This is the case in press releases by Rhenium blockchain,³⁶⁶ JSECoin³⁶⁷, PURA³⁶⁸,

357. *Id.*

358. *Id.*

359. *Id.*

360. M-2 Banking & Credit News, *Paxos, BitPay to Partner to Create Global Bitcoin Payment Service*, (Nov. 30, 2018) <https://www.proquest.com/docview/2139574361/fulltext/CA056AF3EAB046A1PQ/1?accountid=10477&sourcetype=Wire%20Feeds>.

361. Global Banking News, *BitPay Adds Polygon Network to Expand Crypto Payment Options*, (Oct. 27, 2022).

362. *Id.*

363. Global Banking News, *Polygon Invests in Blockchain Founders Fund II to Support Blockchain Development*, (Oct. 3, 2022).

364. *Id.*

365. Ossinger, *supra* note 281.

366. M2PressWire, *Rhenium, the New Blockchain Solution in the Market for an Eco-Friendly Sustainable Cryptocurrency*, (May 10, 2018).

367. M2PressWire, *JSECoin Offers a Straightforward Platform to Mine Cryptocurrency in a Web Browser* (Apr. 27, 2018).

368. PR Newswire, *PURA Cryptocurrency Provides Sustainability Platform PURA-Early-Adopters* (PR Newswire 2017) <https://www.epicos.com/article/203593/pura-cryptocurrency-provides-sustainability-platform>, See also PR Newswire, *PURA Announces Partnership with BitXatm* (PR Newswire 2017).

Cardano on KuCoin³⁶⁹; TeraWulf³⁷⁰, AltaFin³⁷¹ and T REX.³⁷² TeraWulf claims that it generates an environmentally sustainable bitcoin that uses over 90% zero-carbon energy for 50MW of mining capacity³⁷³; but does not state how.

With respect to the provision of smart renewable energy, smart grid services that accept cryptocurrency payments exist. “[T]here is no regulatory control for standardising cryptocurrency in the blockchain environment. This tendency can seriously impact customers due to frequent rate fluctuations.”³⁷⁴ Further, the convertibility of volatile cryptocurrency is a challenge since customers may want to pay but the available balance is insufficient due to cryptocurrency volatility. This type of issue may deter the mainstream adoption of blockchain technology in the long term. Cybersecurity threats are also a challenge.³⁷⁵ In addition, when deciding on which cryptocurrencies to invest in, Daniel Liebau of Modular Asset Management stated that “[a] poorly designed consensus mechanism can be tampered with, undermining trust in the blockchain.”³⁷⁶ So, the consensus mechanism and cybersecurity go hand in hand.

In a January 2022 hearing, US lawmakers in the House Subcommittee on Oversight and Investigations grappled with “balancing the energy consumption of cryptocurrency’s mining process alongside the opportunities for blockchain technology.”³⁷⁷ Cornell University’s Professor Ari Juels stated that while the Bitcoin community deserves our deep gratitude, we have more energy-efficient alternatives than [PoW] which need to be embraced.”³⁷⁸

3. Improved Consensus Crypto Mining Mechanisms

Ethereum reported that by using the PoS method, the energy cost of each transaction could be cut by 99.95%.³⁷⁹ Consensus is a protocol for

369. M2PressWIRE, *Cardano (ADA) Gets Listed on KuCoin! Get Cardano Tokens Now!*, (July 5, 2019).

370. PR Newswire, *TeraWulf Merges with IKONICS to List Publicly on NASDAQ*, (June 30, 2021). See also, Business Wire, *TeraWulf Announces Amendments to its Nautilus Joint Venture*, (Aug. 31, 2022).

371. PR Newswire, *AltaFin Launches AFN Token ICO, Earn Lending*, (Aug. 25, 2021).

372. PR Newswire, *TREX Acquisition Corp Announces New Business Venture*, (Mar. 10, 2022).

373. PR Newswire, *supra* note 370.

374. Jagdish Prasad Nepal, et al., *Blockchain-Based Smart Renewable Energy: Review of Operational and Transactional Challenges*, 15 ENERGIES (2022).

375. *Id.*

376. Ossinger, *supra* note 282.

377. Cristobella Durette, *Experts Recommend Renewable Energy, Alternative Ways to Clean Up Cryptocurrency*, UPI, (Jan. 2, 2022) https://www.upi.com/Top_News/US/2022/01/20/cryptocurrency-energy-consumption-House-hearing/1771642715907/

378. *Id.*

379. Hindustan Times, *supra* note 198.

‘reaching consensus’ using group engagement despite constant changes and energetic activities. Coordination is an issue and can be tampered with if a bad actor secretly creates a conflicting message that makes the group fail to act in unison. Failing to reach consensus is a Byzantine General Problem (BGP). The Byzantine Failure Tolerance (BFT) can tolerate failure in the face of the BGP. “In order to prevent the occurrence of the Byzantine faults, the blockchain systems rely on consensus algorithms, such as PoW and PoS, to endorse transactions.”³⁸⁰ In 2018, the company Modern Finance Chain claims they created a sustainable cryptocurrency ecosystem using a BFT/PoS consensus approach with a special master node incentive scheme.³⁸¹ In 2019, Bitcoin OIL (Optimally Improved Ledger) claims it drastically reduces its bitcoin energy consumption by altering its consensus protocol to PoS.³⁸²

Both Bitcoin and Ethereum can run on the PoW consensus. Bitcoin’s is called Hashcash and Ethereum’s is called Ethash.³⁸³ Kher states that the PoW consensus is the main cause of sluggish transactions and an inefficient use of energy.³⁸⁴ PoW requires considerable computing power and energy for administration.³⁸⁵ Since 2019, the cryptocurrency *Signum* claims it uses Proof of Commitment (“PoC+”) decentralized consensus as a greener option because it can increase capacity without purchasing more equipment.³⁸⁶

Directed Acrylic Graphs (“DAGs”) are also touted as being able to reduce the energy consumption of PoW. DAGs have users at nodes validate transactions and confirmations are made faster with the more

380. Rui Zhang, et al., *Security and Privacy on Blockchain*, 52 ACM COMPUT. SURV. 1, 23 (2019).

381. PR Newswire, *supra* note 237.

382. CISION PRWeb, *Bitcoin Oil Corp. Announces the Engagement of FRORIEP LEGAL AG for the Legal Representation of BitcoinOil GmbH* (Aug. 19, 2019, 9:00 AM) https://www.prweb.com/releases/Bitcoin_Oil_Corp_Announces_the_Engagement_of_FRORIEP_LEGAL_AG_for_the_Legal_Representation_of_BitcoinOil_GmbH/prweb16513151.htm

383. Victor Holotescu & Radu Vasiiu, *Challenges and Emerging Solutions for Public Blockchains*, 11 BRAIN: BROAD RSCH. IN A.I. & NEUROSCIENCE 58, 63 (2020).

384. Kher et al., *supra* note 189, at 1704-05 (citing Mitsuru Iwamura, et al., *Can We Stabilize the Price of a Cryptocurrency? Understanding the Design of Bitcoin and its Potential to Compete with Central Bank Money*, HITOTSUBASHI UNIV. REPOSITORY DISCUSSION PAPER SERIES A 617; K. J. O’Dwyer & D. Malone, *Bitcoin Mining and its Energy Footprint*, 25TH IET IRISH SIGNALS & SYS. CONF. 2014 AND 2014 CHINA-IRELAND INT’L CONF. ON INFO. AND COMM’N TECH. 280 (2014); Se-Chang Oh, et al., *Implementation of Blockchain-Based Energy Trading System*, 11 ASIA PACIFIC J. OF INNOVATION AND ENTREPRENEURSHIP 332 (2017)).

385. Holotescu & Vasiiu, *supra* note 383, at 62. See Heather Hughes, *The Complex Implications of Fintech for Financial Inclusion*, 84 L. & CONTEMP. PROBS. 113, 118 (2021); Heather Hughes, *Blockchain and the Future of Secured Transactions Law*, 3 STAN. J. OF BLOCKCHAIN L. & POL’Y 1, 13 (2020).

386. PR Newswire, *Blockchain Goes Green: Signum - The World’s First Truly Sustainable Blockchain Steps Into the Light* (July 1, 2021, 2:00 AM) <https://www.prnewswire.com/news-releases/blockchain-goes-green-signum---the-worlds-first-truly-sustainable-blockchain-steps-into-the-light-301320293.html>.

users there are. DAGs, such as the Hedera Hashgraph running on a PoS consensus, are touted as being able to reduce the energy consumption of PoW.³⁸⁷ Monti & Rasmussen tout that their software RAIN is a high-uptime, low-power nodes platform based on authenticated hash tables instead of blockchains and no need for PoW.³⁸⁸

Permissionless and some permissioned PoW consensus blockchain algorithms consume a great deal of energy. However, permissioned blockchain may use other algorithms such as the HyperLedger Fabric which provides several consensus algorithms for use on a Hyperledger platform. Researchers evaluated a Hyperledger Fabric and discovered bottlenecks which thwart the rate of economic transactions in a decentralized mesh network.³⁸⁹ Time-consuming consensus process is the primary bottleneck of adopting blockchain technology.³⁹⁰ Perhaps this is one reason for slow merchant adoption. Guitierrez stated that “one adoption problem is the issue of Hyperledger’s scalability.³⁹¹ The consensus algorithms have limits.”³⁹² Yet, the Blockchain Training Alliance compared Ethereum ad Hyperledger Fabric and stated that “Fabric solves performance scalability and privacy issues by permissioned mode of operation and by using a BFT algorithm and fine-grained access control.”³⁹³

The Tomlinson article found 60 ‘Blockchain for Good’ projects using cryptocurrency with coins that are ESG related.³⁹⁴ They selected 28 that had enough data for them to meaningfully analyze.³⁹⁵ They analyzed these projects as they related to 3 blockchain sustainability dilemmas: 1) energy cost versus security, 2) value propositions versus state regulation, and 3) decentralization versus democratic transparency.³⁹⁶ The project included, but were not limited to, topics such as

387. Holotescu & Vasii, *supra* note 383, at 67-68, 77.

388. Matteo Monti & Steen Rasmussen, *RAIN: A Bio-Inspired Communication and Data Storage Infrastructure*, 23 *ARTIFICIAL LIFE* 552, 554 (2017).

389. Mennan Selimi, et al., *Towards Blockchain-Enable Wireless Mess Network* MOBI SYS CRY-BLOCK, WORKSHOP 13, 18 (2018).

390. Houshyar Honar Pajooh, et al., *Experimental Performance Analysis of a Scalable Distributed Hyperledger Fabric for a Large-Scale Lot Testbed*, 22 *SENSORS* 1, 2 (2022). See Blockchain Training Alliance, *Ethereum vs. Hyperledger*, (June 27, 2018) <https://blockchaintrainingalliance.com/blogs/news/ethereum-vs-hyperledger>. See Kris Bennett, *Public vs. Private Blockchain for Enterprise*, YOUTUBE, (June 27, 2018) https://www.youtube.com/watch?v=GgcTm_SoaEY.

391. Carlo Guitierrez, *Hyperledger/ Blockchain Main Drivers, Use Cases, and Implications*, ALTOROS (June 10, 2016) <https://www.altoros.com/blog/hyperledger-blockchain-requirements-and-adoption-bottlenecks/>.

392. *Id.*

393. Blockchain Training Alliance, *supra* note 390. Bennet, *supra* note 390.

394. Bill Tomlinson, et al., *Analyzing the Sustainability of 28 ‘Blockchain for Good’ Projects via Affordances and Constraints*, 27 *INFO. TECH. FOR DEV.* 439, 446 (2021).

395. *Id.* at 440.

396. *Id.* at 445.

supply chain tracking, transparency in charitable giving and fair voting.³⁹⁷ The researchers found no evidence that these projects overcame concerns about energy consumption, crime, and lack of democratic transparency.³⁹⁸

Regarding the selection of retirement investments, the Biden Administration's proposed rule dated early October 2021 allows retirement plan fiduciaries to take climate change and other ESG issues into account.³⁹⁹ A US Department of Labor Sustainable Impact Investing rule was adopted in November 2022 for the selection of investment funds allowing employers to consider ESG factors and climate change for 401(k) plans.⁴⁰⁰ This is related to cryptocurrency investing because crypto mining's impact on ESG can get taken into consideration. It is not a mandated consideration. But at least it is currently allowed.

In March 2022, there was angst over whether the European Parliament's Economic and Monetary Affairs Committee would vote in favor of a new regulatory framework called the Markets in Crypto-Assets ("MiCa").⁴⁰¹ Crypto industry executives were worried that the legislation could ban Bitcoin and Ethereum in Europe because the assets would be subject to minimum environmental sustainability standards and needed to be set up to comply with those requirements.⁴⁰² The industry concern is over whether MiCa would ban or curb the PoW consensus mechanism.⁴⁰³ However, the committee voted against MiCa which would have added "cryptocurrency mining to the EU's taxonomy for sustainable finance, which would define whether crypto can be viewed as a sustainable investment."⁴⁰⁴

397. *Id.* at 453.

398. *Id.* at 457.

399. Brian Croce, *ESG, Cryptocurrency Discussed a Lot but Not Often Adopted*, PENSIONS & INV., (Aug. 1, 2022, 12:00 AM) <https://www.pionline.com/special-report-dc-money-managers/esg-cryptocurrency-discussed-lot-not-always-adopted-401k-plans-due>

400. Greg Iacurci, *Biden Administration Loosens Trump-Era Investing Rules Around Environment, Social and Governance Funds for 401(k) Plans*, CNBC, (Nov. 22, 2022, 12:10 PM) <https://www.cnbc.com/2022/11/22/biden-administration-loosens-trump-era-esg-rules-for-401k-plans.html>

401. Emily Nicolle & Lyubov Pronina, *EU Crypto Proposal Seen as De-Facto Bitcoin Ban Falls in Vote*, BLOOMBERG, (Mar. 14, 2022, 1:51 PM) <https://www.bloomberg.com/news/articles/2022-03-14/eu-crypto-proposal-seen-as-de-facto-bitcoin-ban-fails-in-vote?embedded-checkout=true>. See also Eyk Henning, *EU to Review Regulatory Framework for Crypto*, BLOOMBERG, (Mar. 12, 2022, 1:39 PM) <https://www.bloomberg.com/news/articles/2022-03-12/eu-near-vote-on-new-regulatory-framework-for-cryptocurrencies?embedded-checkout=true>

402. Nicolle & Pronina, *supra* note 401. Henning, *supra* note 401.

403. Nicolle & Pronina, *supra* note 401. Henning, *supra* note 401.

404. Nicolle & Pronina, *supra* note 401.

4. Use of Carbon Asset Management

Interestingly, in 2017, *ImpactChoice*, a company which offers environmental sustainability solutions launched the coin Earth Token with a Certificate Issuing and Tracking Exchange (“CITEX”) carbon asset management platform to reward businesses for their environmental sustainability efforts.⁴⁰⁵ They claim to use “digital representations of carbon assets to enable companies to compensate for environmental impacts by apportioning emissions to relevant business metrics, mitigating these via internationally accredited and verifiable emissions reduction mechanisms.”⁴⁰⁶ Another reward program called Guardian Circle launched in 2018.⁴⁰⁷ It is a mobile app whereby friends, family and neighbors can serve as emergency responders and get rewarded in cryptocurrency.⁴⁰⁸ All transactions are recorded using blockchain based smart contracts.⁴⁰⁹

In 2022, the T3 Research trading firm joined the 1GCX exchange for tokenized carbon credit and digital assets.⁴¹⁰ T3 Research focuses on carbon offsets and cryptocurrencies.⁴¹¹ This collaboration helps to increase liquidity on the 1GCX exchange.⁴¹² The cryptocurrency Fight the CO2 also established a business model based on the negotiation of carbon credits from their network.⁴¹³ Their goal is to transform the carbon credit investment market by making it accessible to both large and small businesses.⁴¹⁴ When the FCO token is purchased, the buyer has access to water desalination technology developed by FCO’s partner Future Springs. Future Spring is purifying water with mineralization to combat water scarcity in third world countries. FCO plans to inject 55% of the money made in this carbon credit exchange into an investment pool.⁴¹⁵

405. PR Newswire, *ImpactChoice Launches Earth Token Initial Coin Offering Crowdsale* (Oct. 3, 2017, 10:55 AM) <https://www.prnewswire.com/news-releases/impactchoice-launches-earth-token-initial-coin-offering-crowdsale-300529994.html>.

406. *Id.*

407. Canadian Press, *GNW-en-00-MIS-MIS-PDT*, (Apr. 16, 2018).

408. *Id.*

409. *Id.*

410. 1GCX, *1GCX Partners with T3 Research to Launch Liquidity Fund, \$2 Billion in AUM*, BUS. WIRE, (Sept. 28, 2022, 12:00 PM) <https://www.businesswire.com/news/home/20220928005297/en/1GCX-Partners-With-T3-Research-to-Launch-Liquidity-Fund-2-Billion-in-AUM>

411. *Id.*

412. *Id.*

413. PR Newswire, *Fight the CO2 - the Real Carbon Credits Evolution in the Blockchain*, (June 20, 2022, 11:00 AM) <https://www.prnewswire.com/news-releases/fight-the-co2---the-real-carbon-credits-evolution-in-the-blockchain-301570962.html>.

414. *Id.*

415. *Id.*

In 2021, the crypto platform Gemini launched Gemini Green which purchases carbon permits for 350,000 metric tons of carbon to offset its use of the Bitcoin Network.⁴¹⁶ This is done in partnership with the University of Chicago's Climate Vault which facilitates "the purchase of carbon permits directly from government-regulated cap-and-trade markets and removed them from circulation. This prevents other market participants from using these carbon permits to emit CO2 and reduces the overall supply of carbon permits."⁴¹⁷ In fact, creating green financial products is one of the European Union's focus areas in their *Action Plan on Financing Sustainable Growth*.⁴¹⁸ In 2017, during a mid-term review of the European Commission's ("EC") Capital Markets Union ("CMU") Action Plan, the EC decided to achieve sustainable investment by embedding the ESG issues into their decision-making processes.⁴¹⁹ Based on the Paris Climate Agreement, fintech and crypto industry leaders, the Energy Web Foundation, RMI and Alliance for Innovative Regulation drafted a Crypto Climate Accord.⁴²⁰ This is a pledge to decarbonize the industry.⁴²¹ Signatories pledge to achieve net-zero greenhouse gas emissions in their data centers by 2040, creating standards, and achieving net zero emissions from electricity usage by 2030 toward the blockchain industry becoming 100% renewably powered before the 2025 United Nations Convention on Climate Change ("UNFCCC") COP30 conference.⁴²² Gryphon signed the accord.⁴²³ Ripple is also a signatory.⁴²⁴

In May 2021, UBS conducted a survey of 3800 investors and nearly 60% reported that they were more interested in sustainable investing.⁴²⁵ Having crypto along with gold, cash, real estate, and stocks is a part of a diversified portfolio. Further, "carbon credits will become large tradable commodities and it's not far-fetched to consider holding an exposure in the same way some investors have other energy exposure in

416. Global Banking News, *Gemini Launches Gemini Green to Add Climate Conscious Practices to Decarbonize Bitcoin*, (June 29, 2021).

417. *Id.*

418. European Commission Action Plan, *Financing Sustainable Growth*, https://finance.ec.europa.eu/system/files/2018-03/180308-action-plan-sustainable-growth-factsheet_en.pdf

419. Paula Redondo Pereira & Jane Wilkinson, *LuxSEs Sustainable Finance Drive*, INT'L FIN. L. REV. (2018).

420. PR Newswire, *supra* note 330.

421. *Id.*

422. *Id.*

423. *Id.*

424. PR Newswire, *Ripple and Nelnet Announce \$44 Million Clean Energy Fund for a More Sustainable Future*, (Oct. 11, 2021) <https://www.prnewswire.com/news-releases/ripple-and-nelnet-announce-44-million-clean-energy-fund-for-a-more-sustainable-future-301397272.html>

425. Peter Esho, *Prepare for a Green Future*, MONEY, (2021).

their portfolio.”⁴²⁶ On the carbon market, emissions permits that have been issued by a regulatory authority or that are produced by greenhouse gas (“GHG”) projects can be purchased and sold. Carbon credits are used in the trading of the GHG emission reductions. A carbon credit represents “the reduction of GHGs equal to one metric ton of carbon dioxide equivalent (“tCO₂e”).”⁴²⁷ In March 2022, Evergreen Carbon Credits (“ECC”) announced the development of a special way to buy and verify carbon credits using blockchain and NFTs.⁴²⁸ Using a unique online calculator, companies can choose how many carbon credits they want to buy and subsequently get a resultant NFT certificate delivered to a digital wallet.⁴²⁹ This system accepts cryptocurrency for the payments.⁴³⁰

By June 2022, James Malcolm of UBS reported that crypto businesses were under significant pressure “due to high energy costs and capex commitments” to begin capitulating and selling off their existing coin holdings.⁴³¹ In August 2022, Flowcarbon announced a series of blockchain partnerships to build the framework for utilizing Flowcarbon’s tokenized carbon credits across Celo blockchain-based applications.⁴³² Unfortunately, regulators are neglecting the environmental impact of mining cryptocurrencies. The tech firm CUBE conducted a study and issued a report entitled ‘Cryptopia: Regulation & Crypto on a Cliff Edge’ which states that less than 0.1% of proposed guidelines address the carbon footprint issue.⁴³³ This report points out that while banks commit to green projects, they are also hypocritically investing in cryptocurrencies which are not green.⁴³⁴

426. *Id.*

427. Ricardo Bayon, et al., *Voluntary Carbon Markets an International Business Guide to What They are and How They Work*, 5 ROUTLEDGE EARTHSCAN. (2nd ed. 2009).

428. PR Newswire, *Evergreen Carbon Credits: Carbon Credits and Cryptocurrencies with NFT's* (Mar. 15, 2022, 8:20 AM) <https://www.prnewswire.com/news-releases/evergreen-carbon-credits-carbon-credits-and-cryptocurrencies-with-nfts-301502860.html>.

429. *Id.*

430. *Id.*

431. Hajric, *supra* note 263.

432. Flowcarbon, *Flowcarbon to Expand Access to Carbon Credits with New Partnerships*, BUSINESS WIRE, (Aug. 23, 2022, 6:25 AM) <https://www.businesswire.com/news/home/20220822005668/en/Flowcarbon-To-Expand-Access-to-Carbon-Credits-with-New-Partnerships>.

433. Luke Pearce, *Regulators Neglecting Green Impact of Crypto Mining*, GLOBAL INVESTOR, (July 25, 2022) <https://news.fow.com/articles/3698870/regulators-neglecting-green-impact-of-crypto-mining-report>.

434. *Id.*

5. Use of Sharding

The use of smart contracts is a significant blockchain technology contribution by Ethereum. However, note that Ethereum uses accounts rather than coins.⁴³⁵ The accounts have recorded account balance, storage, contract code, public key address and nonce.⁴³⁶ The smart contracts are autonomous agents that can execute contract code upon receiving messages.⁴³⁷ The contract is sent Ether gas (hence the name Ethereum) as a monetary price to execute the contract code.⁴³⁸ By 2015, the use of smart contracts had become more favorable than cryptocurrency.⁴³⁹ Smart contracts need sound legal bases. If used to establish an organization, the legal status of that organization may be unclear since the smart contract could result in distributed management of the organization.⁴⁴⁰ “If smart contracts proliferate, judges and juries will have to review them to determine their legal basis and evidentiary status.”⁴⁴¹

Sharding splits and stores a single logical dataset in multiple databases to distribute the data among multiple machines to store larger datasets and handle additional request.⁴⁴² To shard, the Ethereum network must be divided into several shard sections.⁴⁴³ A distinct set of account balances and smart contracts are stored in each shard’s autonomous, independent state.⁴⁴⁴ Apollo cryptocurrency claims that its database sharding is sustainable because it reduces wasteful blockchain bloat.⁴⁴⁵ It eliminates wasteful block creation; and lowers data use and storage.⁴⁴⁶ Each block adds only a small amount of data; but accumulates over time which leads to astronomically large databases that operate at slower speeds and reduced functionality.⁴⁴⁷ However, in Apollo’s 2019 press releases about sharding, Apollo does not note the energy

435. Edwards, et al., *supra* note 37, at 5.

436. *Id.*

437. *Id.*

438. *Id.*

439. Peters, et al., *supra* note 63, at 6.

440. David Mills, et al., *Distributed Ledger Technology in Payments, Clearing, and Settlement*, 95 FIN. AND ECON. DISCUSSION SERIES 1, 29 (2016).

441. *Id.*

442. Jeeyoung Kim, *How Sharding Works*, MEDIUM, (Dec. 5, 2014) <https://medium.com/@jeeyoungk/how-sharding-works-b4dec46b3f6>.

443. Education District Oxio, *Ethereum Sharding Explained*, DISTRICTOX NETWORK, <https://education.districtox.io/general-topics/understanding-ethereum/ethereum-sharding-explained/>.

444. *Id.*

445. Renato Capelj, *Apollo Cryptocurrency Brings You Database Sharding*, BENZINGA, (July 26, 2019) <https://finance.yahoo.com/news/apollo-cryptocurrency-brings-database-sharing-190413576.html>.

446. *Id.*

447. Global Banking News, *Apollo Implements Database Sharding*, (Aug. 2, 2019).

savings.⁴⁴⁸ Further, while not sharding, the Circular Drive Initiative (CDI) seeks to reuse e-waste by promoting and enable the secure reuse of old drives in cryptocurrency mining data centers that still have value.⁴⁴⁹

6. Cryptocurrency and Nfts for Environmental Sustainability Project Funding

Some companies claim they are environmentally sustainable because they use cryptocurrency as donations to fund environmental and social projects. Millennials love online social, mobile, and digital portals. Donations via digital fundraising campaigns are popular. An example of an entrepreneurial endeavor is how the firm Digital Donations launched a 506c equity financing campaign to raise up to \$5 million USD using Crowdfunder.⁴⁵⁰ The funds are to be used to develop a fundraising platform that includes the PayGIV digital wallet and CoinGIV cryptocurrency.⁴⁵¹

In September 2016, the Luxembourg Stock Exchange (“LuxSE”) opened a S&S window on its Green Exchange (“LGX”) trading platform for climate-friendly sustainable and social green bond projects.⁴⁵² This exchange uses the Ethereum block chain-based platform to ensure transparency.⁴⁵³ To access the LGX, first, issuers must list a security on one of LuxSE’s EU-regulated Bourse de Luxembourg or euro MTF markets.⁴⁵⁴ In February 2016, France passed a law “requiring a broad range of investors to report how their environmental, social and governance (ESG) strategies figure into their investments, as well as the first mandatory carbon-reporting requirement for investors.”⁴⁵⁵ With the LGX, issuers must commit to routine post-issuance reporting,

448. Apollo Foundation, *Apollo Currency Releases Sharding, Solving Blockchain Sustainability*, PR Newswire (Jun 24, 2019, 05:00 PM) <https://www.prnewswire.com/news-releases/apollo-currency-releases-sharding-solving-blockchain-sustainability-300873788.html>.

449. Business Wire, *Circular Drive Initiative Launches, Publishes Findings on Circularity*, (Nov. 3, 2022, 8:15 AM) <https://www.businesswire.com/news/home/20221103005500/en/Circular-Drive-Initiative-Launches-Publishes-Findings-on-Circularity>.

450. PR Newswire, *Digital Donations Launches \$5M Campaign to Back Its Own Crypto ‘Coin’*, Business Insider, (Oct. 3, 2017, 6:00 AM) <https://markets.businessinsider.com/news/stocks/digital-donations-launches-5m-campaign-to-back-its-own-crypto-coin-1001726657>.

451. *Id.*

452. Graham Bippart, *SRI to Shine New LuxSE Window*, EUROMONEY (May 18, 2017), <https://www.euromoney.com/article/b131mg8cf8w2rs/sri-to-shine-new-luxse-window>.

453. *Id.*

454. *Id.*

455. *Id.*

provide further information about the intended use of proceeds, and give an ex-ante external evaluation.⁴⁵⁶

While Initial Coin Offerings (“ICOs”) issuing cryptocurrency have met the demand for efficient, borderless, and secure capital transfers, the LakeDiamond ICO did not do as well as anticipated.⁴⁵⁷ It had a confusing tokenization procedure, poor monitoring, ownership rights issues and a poorly targeted investor group.⁴⁵⁸ Rrustemi & Tuchschnid research on fundraising campaigns also discusses how security token offerings (“STOs”) and initial exchange offerings (“IEOs”) are alternatives to ICOs.⁴⁵⁹

There are examples of successful ICOs. In 2017, the Brazilian blockchain technology firm Moeda Seeds launched the Moeda Initial Coin offering to raise funds via cryptocurrencies to expand its services.⁴⁶⁰ In order to supply financial services and goods, Moeda makes use of blockchain technology.⁴⁶¹ Moeda’s founder Taynaah Reis collaborated with Brazil’s Parliamentary Special Committee on Virtual Currency to outline the potential future applications of virtual currency.⁴⁶² The Brazilian Central Bank acknowledged her efforts.⁴⁶³ Moeda also started a blockchain to track and evaluate its initiatives’ UN SDG commitments.⁴⁶⁴ The projects must be closely watched in total transparency.⁴⁶⁵ Moeda used the IBM Hyperledger Fabric to allow Seed Projects to be monitored with full transparency.⁴⁶⁶

Another example is the PURA payment cryptocurrency platform that can track donations transparently.⁴⁶⁷ PURA states that it provides a way for people to not only be their own bank, but also be their own government since it is community driven.⁴⁶⁸ Howson states that blockchains

456. *Id.*

457. Jahja Rrustemi & Nils S. Tuchschnid, *Fundraising Campaigns in a Digital Economy: Lessons from a Swiss Synthetic Diamond Venture’s Initial Coin Offering (ICO)*, 10 *TECH. INNOVATION MGMT. REV.* (2020).

458. *Id.*

459. *Id.*

460. Leticia Cristina Kanegae, et. al, *Moeda Seeds: E-Commerce and Crypto Solutions for Development*, 25 *REVISTA DE ADMINISTRAÇÃO CONTEMPORÂNEA* 172 (2021).

461. *Id.*

462. *Id.*

463. *Id.*

464. *Id.*

465. *Id.*

466. *Id.*

467. PR Newswire, *supra* note 368.

468. *Id.*

are almost completely hack proof and advocates their use by nonprofits for the management of donations.⁴⁶⁹

NFTs are defined as any “digital offering or asset that purports to be unique and non-interchangeable, the majority of which are on the Ethereum blockchain.”⁴⁷⁰ NFTs allow things to be tokenized for one owner and each item gets secured by the Ethereum blockchain.⁴⁷¹ The items could be art, collectibles, or real estate. For example, cosmetic companies are beginning to accept payments in cryptocurrency and there is beauty focused NFTs. The Jeffree Star x marcelo Cantu NFT Collection announced that consumers can buy a NFT piece of art and redeem it for Rook Perfume. Yet, the electricity consumption is a concern.⁴⁷²

In 2021, Ethereum was criticized for NFT transactions that emit enough energy each day to power two American families’ homes.⁴⁷³ Yet, there are some green platforms. For example, the Lambda256 cryptocurrency exchange claims that it has a green NFT platform on its Luniverse sidechain which provides “a carbon neutral NFT ecosystem, bridging creators, wallet partners and collectors to their markets at a fraction of the cost of gas and energy.”⁴⁷⁴ Luniverse uses a transaction validation algorithm called Luniverse Proof of Authority (“LPoA”).⁴⁷⁵ In September 2022, Big Eyes Coin launched a NFT collection for content providers to sell their work built on an Ethereum blockchain with the PoS consensus.⁴⁷⁶ Also, in August 2022, at the Monaco Crypto Summit, the Prince Albert II of Monaco Foundation revealed a blockchain-based app that would enable donors to make contributions in the cryptocurrency used by the DigitalBits blockchain.⁴⁷⁷ They can also purchase

469. Peter Howson, *Crypto-giving and Surveillance Philanthropy: Exploring the Trade-offs in Blockchain Innovation for Nonprofits*, 31 NONPROFIT MGMT. & LEADERSHIP 43 (2021).

470. Pete Cherecwich, *Custody Rebooted: How the Asset Servicing Industry Must Adapt for the Digital Future*, 14 J. OF SEC. OPERATIONS & CUSTODY (2021).

471. *Id.*

472. Global Cosmetic Industry, *Part I: Sustainability Under Scrutiny Why Transparency Matters More than Ever*, (June 30, 2021) <https://www.gcimagazine.com/ingredients/regulatory/article/21849407/waste-free-beauty-part-1-sustainability-under-scrutiny>.

473. PR Newswire, *Upbit/Dunamu Subsidiary Lambda256 Reveals Green NFT Marketplace Focused on Sustainable Creativity*, (June 16, 2021, 09:00 AM) <https://www.prnewswire.com/news-releases/upbitdunamu-subsidiary-lambda256-reveals-green-nft-marketplace-focused-on-sustainable-creativity-301313454.html>

474. *Id.*

475. *Id.*

476. PR Newswire, *supra* note 262.

477. PR Newswire, *DigitalBits Blockchain Launches the Prince Albert II of Monaco Foundation App in Order to Support its Environmental Missions*, (Jul. 29, 2022, 02:33 PM) <https://www.prnewswire.com/news-releases/digitalbits-blockchain-launches-the-prince-albert-ii-of-monaco-foundation-app-in-order-to-support-its-environmental-missions-301596302.html#:~:text=MONTE%20CARLO%2C%20Monaco%2C%20July%202029,FPA2%20projects%20dedicated%20to%20ocean>.

NFT event tickets and support projects such as ocean conservation and species protection.⁴⁷⁸ Similarly, the Built with Bitcoin Foundation sells NFT artwork to raise money to build schools and communities worldwide.⁴⁷⁹ The community work includes water projects, solar systems, and computer labs.⁴⁸⁰

In August 2022, the Silicon Valley based digital agency YML launched the FIREWATCH NFT project to raise funds for preventing wildfires and to promote reforestation in California through the One Tree Planted non-profit. They claim that their Solana blockchain expends 17 times less energy than a full phone charge and three Google searches. Consumers can buy a carbon-neutral pop-up NFT art piece of the California landscape using their Solana blockchain.⁴⁸¹

The Ripple cryptocurrency firm entered a joint venture with Nelnet Renewable Energy involving a \$44 million investment in a solar energy investment fund to support solar energy projects throughout the United States.⁴⁸² “The solar projects financed by the Ripple Nelnet Renewable Energy Fund are estimated to offset over 1.5 million tons of carbon dioxide over 35 years, which is equivalent amount of CO2 emissions from consuming 154 million gallons of gasoline.”⁴⁸³

Uniquely, Dr. Jackie Lighten of the University of Exeter is harnessing the surge in cryptocurrency investment to fund STEM innovations.⁴⁸⁴ He founded STEM Genesis as a DeFi ecosystem to fund STEM research.⁴⁸⁵ For the sake of community building, this platform will offer NFT Pixel Pongos.⁴⁸⁶ There will be a STEM Genesis crypto-coin that enables users to contribute money directly to STEM projects.⁴⁸⁷

In 2022, at COP27, ConsenSys and Allinfra joined the UNFCC Climate Innovation Hub to reveal the launch of the Ethereum Climate

478. *Id.*

479. The Nation, *Built with Bitcoin Foundation, Ethereum Blockchain Partner*, (Dec. 20, 2021) (Nigeria) <https://thenationonlineng.net/built-with-bitcoin-foundation-partners-satoshibles-on-nft-collection-for-social-good/>.

480. *Id.*

481. PR Newswire, *Digital Agency YML Launches FIREWATCH NFT Project to Restore California Forests*, (Aug. 31, 2022, 10:42 AM) <https://www.prnewswire.com/news-releases/digital-agency-yml-launches-firewatch-nft-project-to-restore-california-forests-301615601.html>.

482. PR Newswire, *supra* note 424.

483. *Id.*

484. PR Newswire, *World's First Cryptocurrency and NFT Investment Fund for Science & Technology is Launched*, (Nov. 30, 2021, 5:00 PM) <https://www.prnewswire.com/news-releases/worlds-first-cryptocurrency-and-nft-investment-fund-for-science--technology-is-launched-301432473.html>.

485. *Id.*

486. *Id.*

487. *Id.*

Platform (“ECP”) alongside civic society leaders.⁴⁸⁸ They aspire to encourage and finance practical initiatives that reduce greenhouse gas emissions (“GHGs”) and have a good impact on the environment and society. Sixteen (16) founding members include Celso, Huobi Japan, Polygon, Microsoft, and others.⁴⁸⁹ Huobi Japan is a centralized cryptocurrency exchange.⁴⁹⁰ In 2019, it sought to raise 4.6 million in a new stock issuance.⁴⁹¹ It also raised 5 million in USD from the Financial Products Group to accelerate its development of block chain technology.⁴⁹²

7. Use of Cryptocurrency can Become Mainstream

By 2017, crypto linked stocks made huge moves and rapid strides in value and market cap that it almost became recognized as a mainstream investment option. This is known as crypto craze.⁴⁹³ Many tout that they are into environmental sustainability.⁴⁹⁴ In 2018, there was potential for central banks to increase interest rates which would affect asset allocation.⁴⁹⁵ At that time, it was predicted that cryptocurrencies would become mainstream.⁴⁹⁶ In 2019, Deutsche Bank reported that cryptocurrency cannot be ignored as demand for alternative currencies may increase if inflation becomes more embedded in the traditional system.⁴⁹⁷ Inflation puts doubts over the sustainability of fiat money.⁴⁹⁸ Washington Post reporter Dan Zak poked fun at climate conscious cryptocurrency traders who participated in Davos 2020.⁴⁹⁹ They shattered their wrists after slipping on black ice because they drank too

488. Consensys, *COP27: Leading Technology Companies Launch ‘Ethereum Climate Platform’ Initiative to Address Ethereum’s Former Proof of Work Carbon Emissions*, (Nov. 17, 2022) <https://consensys.io/blog/cop27-leading-technology-companies-launch-ethereum-climate-platform-initiative-to-address-ethereums-former-proof-of-work-carbon-emissions#>.

489. *Id.*

490. Global Banking News, *Huobi Japan’s to Secure JPY 500m from Stock Issuance*, (Dec. 30, 2019).

491. *Id.*

492. *Id.*

493. Shanthi Rexaline, *Has The Crypto Craze Killed The Marijuana Investing Buzz*, BENZINGA, (Dec. 27, 2017, 05:17 PM) <https://www.benzinga.com/general/education/17/12/10957581/has-the-crypto-craze-killed-the-marijuana-investing-buzz>

494. PR Newswire, *2018: Trends to Watch in Global Wealth Management*, (Jan. 20, 2018, 7:33 AM) <https://www.prnewswire.com/news-releases/2018-trends-to-watch-in-global-wealth-management-300590170.html>.

495. *Id.*

496. *Id.*

497. Varshney, *supra* note 231.

498. *Id.*

499. Dan Zak, *Will Davos Save the World, or Put it Out of its Misery?*, WASH. POST, (Jan. 24, 2020) <https://www.washingtonpost.com/lifestyle/2020/01/24/will-davos-save-world-or-put-it-out-its-misery/>.

much \$5000 bottles of wine and stayed in \$1000 a night hotel rooms.⁵⁰⁰ In 2021, the manager of the investment fund Hostplus was advised by a top Australian venture capitalist to not ignore the cryptocurrency asset class.⁵⁰¹ However, a key question for investors is how environmentally sustainable crypto is.⁵⁰²

Further, in the opinion of Phunware, (a cloud platform that launched the PhunCoin security token) the “mainstream adoption of cryptocurrency will happen as a result of collaborations with technology leaders such as IBM.”⁵⁰³ Phunware was chosen for the IBM Blockchain Accelerator program at the Columbia-IBM Center for Blockchain and Data Transparency.⁵⁰⁴ In addition, the Celo Foundation’s Celo Camp was launched in 2022 as an eight-week virtual accelerator and mentorship program.⁵⁰⁵ Celo has a carbon-negative, mobile-first platform with support from Coinbase Cloud.⁵⁰⁶ In December 2022, KuCoin also announced its KuCoin Labs incubator program with an eight-week training program.⁵⁰⁷

Cryptocurrency firms have been criticized for lacking technical expertise in the technology and economics. There is a need for these firms to hire expertise and get formal training. In December 2018, the blockchain and cryptocurrency company Algorand recognized the need for expertise in guiding their economic policies.⁵⁰⁸ They hired a Chief Economist Pablo Azar.⁵⁰⁹ In October 2022, Accenture began accepting applications for FinTech Innovation Lab New York, a 12-week training program in collaboration with the Partnership Fund for New York City

500. *Id.*

501. Cara Waters, *Hostplus Open to More Crypto Exposure*, THE SYDNEY MORNING HERALD, (May 21, 2021, 04:57 PM) <https://www.smh.com.au/business/banking-and-finance/can-t-be-ignored-hostplus-square-peg-open-to-crypto-investments-20210520-p57tmv.html>.

502. *Id.*

503. Canadian Press, *SYMBOL: NASDAQ: PHUN, NYSE: IBM*, (Jan. 22, 2019).

504. *Id.*

505. Celo Foundation, *Announcing Celo Camp Batch 6, With New Founders Support from Coinbase Cloud*, BUS. WIRE, (Oct. 7, 2022, 09:01 AM) <https://www.businesswire.com/news/home/20221007005125/en/Announcing-Celo-Camp-Batch-6-With-New-Founders-Support-from-Coinbase-Cloud>.

506. *Id.*

507. Seychelles Victoria, *KuCoin Labs Launches Incubation Program to Accelerate Builders*, BUS. WIRE, (Dec. 21, 2022, 07:00 AM) <https://www.businesswire.com/news/home/20221221005164/en/KuCoin-Labs-Launches-Incubation-Program-to-Accelerate-Builders#:~:text=KuCoin%20Labs%20Incubation%20Program%20will,lecture%2C%20workshops%20and%20tutoring%20sessions.&text=The%20Incubation%20Program%20will%20provide,and%20community%20and%20business%20strategy.>

508. Business Wire, *Algorand Appoints Pablo Azar as Chief Economist*, (Dec. 17, 2018, 4:00 AM) <https://www.businesswire.com/news/home/20181217005068/en/Algorand-Appoints-Pablo-Azar-as-Chief-Economist>.

509. *Id.*

with the goal of helping early-stage and growing businesses speed their companies' growth.⁵¹⁰

In January 2022, Thailand's Finance Minister announced that he wants to use digital assets to build the Thai economy by promoting digital asset trade and to use it to raise capital.⁵¹¹ The ministry also wants to forge an easy way for digital asset investors to pay taxes on profits earned from cryptocurrency trading.⁵¹² There is a 15% withholding tax on profits earned from cryptocurrency.⁵¹³ In response, the digital asset exchange operator and other related businesses requested a two-year tax exemption since they claim the industry is fledgling and needs more time to generate sustainable growth.⁵¹⁴ Further, in September 2022, to familiarize itself with blockchain technology, Gulf Energy in Thailand announced a deal to invest in Binance and to form a digital asset exchange called Gulf Binance.⁵¹⁵

The Mall Group created a joint venture with Bitkub Capital Group Holdings to develop a mall that allows customers to use 7 cryptocurrencies in exchange for products and services in department stores.⁵¹⁶ Similarly, in October 2021, Malaysian mall developer Hatten Land partnered with Frontier Digital Asset Management to install rigs and operate 1,000 crypto mining machines in a mall using green cryptomining operations.⁵¹⁷ There is cryptomining in malls and in a museum. In addition, the City of Mobile in Alabama forged a collaboration with the company Distributed Ledger Inc. ("DLI") to use a shipping container to house crypto mining as part of the GulfQuest Maritime Museum.⁵¹⁸

510. Accenture, *FinTech Innovation Lab New York Now Accepting Applicants for 2023 Class*, (Oct. 26, 2022) <https://newsroom.accenture.com/news/2022/fintech-innovation-lab-new-york-now-accepting-applicants-for-2023-class>.

511. Wichit Chantanusornsiri, *Arkhom Pledges Support, but Recent Rules Cast Doubt*, BANGKOK POST, (Jan. 28, 2022, 4:11 PM) <https://www.bangkokpost.com/business/2254883/arkhom-pledges-support-but-recent-rules-cast-doubt?>.

512. *Id.*

513. *Id.*

514. *Id.*

515. Srisamorn Phoosuphanusom & Yuthana Praiwan, *Gulf Vows to Stick with Binance Deal*, Bangkok Post, (Sept. 5, 2022, 09:30 AM) <https://www.bangkokpost.com/business/general/2384280/gulf-vows-to-stick-with-binance-deal>.

516. Pitsinee Jitpleecheep & Nuntawan Pholkwamdee, *Mall Group, Bitkub Form Digital Community*, Bangkok Post (Dec. 1, 2021, 6:12 AM) <https://www.bangkokpost.com/business/general/2224567/mall-group-bitkub-form-digital-community>.

517. Joanna Ossinger, *Asian Mall Operator Taps Bitcoin Mining, NFTs to Boost Income*, BLOOMBERG, (Oct. 8, 2021, 5:00 PM) <https://www.bloomberg.com/news/articles/2021-10-08/asian-mall-operator-taps-bitcoin-mining-nfts-to-boost-income>.

518. PR Newswire, *Distributed Ledger and the City of Mobile, Alabama Announce Bitcoin Mining Project at GulfQuest Maritime Museum*, (May 11, 2022, 10:00 AM) <https://www.prnewswire.com/news-releases/distributed-ledger-and-the-city-of-mobile-alabama-announce-bitcoin-mining-project-at-gulfquest-maritime-museum-301544441.html>.

Mobile plans to use the crypto mining revenue to fund its infrastructure projects.⁵¹⁹ Note that these mall and museum ideas are not far-fetched because in 2021, Iran discovered 212,373 illegal crypto mining hardware.⁵²⁰ The consumption of these devices is equal to the power consumption of 1,343 housing units.⁵²¹ The mining caused power supply limits for electricity subscribers.⁵²² The Iranian government announced that it would cut off electricity to the illegal miners.⁵²³

In 2022, from January 25th to February 8th, the SEC held a public hearing on rules to prohibit use of digital assets for buying products and services.⁵²⁴ The SEC, Bank of Thailand, and Finance Ministry issued a joint statement about concerns over how cryptocurrency payments could impact financial stability and increase risks.⁵²⁵ Similarly, in February 2022, the US Department of Labor cautioned 401K plan fiduciaries to use cryptocurrencies with extreme caution as an investment alternative.⁵²⁶ In April 2022, Fidelity announced that participants in DC client plans could place up to 20% of their 401(k) plans accounts in Bitcoin in a digital asset account.⁵²⁷

In April 2022, Binance was given permission by the Abu Dhabi Global Market (“ADGM”) to act as broker-dealer for virtual assets.⁵²⁸ Customers can use cryptocurrency to buy goods.⁵²⁹ In 2018, the ADGM introduced a comprehensive, robust virtual asset regulatory framework.⁵³⁰ In July 2022, The Cryptoverse Report by the KuCoin cryptocurrency exchange revealed that approximately 3 million Saudi Arabians (14% of the adult population) have become crypto investors and traders with an additional 17% stating they are crypto-curious.⁵³¹ Interestingly, in

519. *Id.*

520. Trend News Agency, *Iran Continues Crackdown Illegal Cryptocurrency Mining*, (Aug. 18, 2021, 3:52 PM) <https://en.trend.az/business/finance/3471074.html>.

521. *Id.*

522. *Id.*

523. *Id.*

524. Reuters, *Thailand to Regulate Use of Digital Assets as Payments*, BANGKOK POST, (Jan. 25, 2022, 7:01 PM) <https://www.bangkokpost.com/life/tech/2253319/thailand-to-regulate-use-of-digital-assets-as-payments>.

525. *Id.*

526. Brian Croce, *Department of Labor Slams Lawsuit Seeking to Overturn Cryptocurrency Guidance*, PENSIONS & INV., (Nov. 16, 2022, 3:32 PM) <https://www.pionline.com/cryptocurrency/department-labor-slams-lawsuit-seeking-overturn-cryptocurrency-guidance>

527. *Id.*

528. Waheed Abbas, *Cryptocurrency in UAE: Binance gets ADGM Approval to Operate as Broker-Dealer*, KHALEEJ TIMES, (Apr. 10, 2022, 1:07 PM) <https://www.khaleejtimes.com/cryptocurrency/cryptocurrency-in-uae-binance-gets-adgm-approval-to-operate-as-broker-dealer>.

529. *Id.*

530. *Id.*

531. Seychelles Victoria, *More Saudi Arabian Crypto Investors Adopting Auto-trading Strategies in Bearish Market*, BUS. WIRE (July 13, 2022, 6:00 AM) <https://www.businesswire.com/news/>

July 2021, the Malaysian government stopped the Binance exchange's crypto operations after allegations of illegalities.⁵³²

In May 2022, the Wyoming Public Service Commission acknowledged that they are unable to provide huge industrial users with the cheap volume of electricity they require.⁵³³ Deregulated power zones would have been permitted under the Senate File 71 ("SF71"), but it failed to pass.⁵³⁴ Although SF 71 was designed for the crypto industry, few representatives for the crypto industry were in attendance during legislative meetings about power issues.⁵³⁵

In August 2022, the City of Lugano in Switzerland announced that it was developing an infrastructure for the use of Bitcoin, Tether and its own LVGA token.⁵³⁶ Their goal is to allow their citizens to pay their taxes and make purchases with cryptocurrency.⁵³⁷ The city wants to become a hub for blockchain technology development.⁵³⁸

8. Use Cryptocurrency to Resolve Unbankedness

Besides Deutsche Bank's enthusiasm, Lennix Lai of the OKEx cryptocurrency exchange gave speeches at Davos 2020 to bring attention to the concepts of 'unbankedness' and 'inclusive sustainable development.'⁵³⁹ This is the phenomenon that there are 2 billion people in under-developed countries that do not have access to traditional financial banking services because these services have high operational costs.⁵⁴⁰ "According to the World Bank, almost 35% of the world's population has no banking account."⁵⁴¹ In a book review of Vigna &

home/20220713005012/en/KuCoin-Into-The-Cryptoverse-Reveals-Increase-In-Number-of-Saudi-Arabian-Crypto-Investors-Adopting-Auto-trading-Strategies-in-Bearish-Market.

532. Joanna Ossinger, *Binance Drama as Malaysia Alleges Illegal Operations*, BLOOMBERG, (Jul. 30, 2021, 9:26 AM) <https://www.bloomberg.com/news/articles/2021-07-30/binance-drama-deepens-as-malaysia-alleges-illegal-operations?embedded-checkout=true>.

533. Jonathan Make, *Deregulation Fears, Power Limitations Stymie any Crypto and Industrial Power Breakthrough*, WYOMING TRIBUNE-EAGLE, (May 23, 2022) https://www.wyomingnews.com/news/local_news/deregulation-fears-power-limitations-stymie-any-crypto-and-industrial-power-breakthrough/article_72d92792-5fd4-58a4-8b6f-f28d5bcc2d48.html.

534. *Id.*

535. *Id.*

536. Airline Industry Information, *BBVA-Lugano Stakes Claim to Become Cryptocurrency Capital of Europe*, EBSCO HOST REGIONALS NEWS, (2022) <https://www.bbva.com/en/innovation/lugano-stakes-claim-to-become-cryptocurrency-capital-of-europe/>.

537. *Id.*

538. *Id.*

539. PR Newswire, *Blockchain Can Achieve Inclusive Sustainable Development, OKEx Executive Says in Davos*, (Jan. 22, 2020, 3:00 AM) <https://www.prnewswire.com/news-releases/blockchain-can-achieve-inclusive-sustainable-development-okex-executive-says-in-davos-300990941.html>.

540. *Id.*

541. Kanegae, et al., *supra* note 460.

Casey's *The Age of Cryptocurrency: How Bitcoin and Digital Money are Challenging the Global Economic Order*, Rid noted that digital money could be quite appealing to the more than 2 billion individuals who lack banking service access.⁵⁴² Digital currency can help these people save money.⁵⁴³

One substantial benefit of digital is access to money for the unbanked.⁵⁴⁴ Unbankedness is a problem for countries like El Salvador. Yet, in June 2021, President Nayib Bukele decided that El Salvador would be the first in the world to formally adopt the Bitcoin digital currency as legal tender.⁵⁴⁵ The former US President called Bitcoin a scam; and El Salvador's decision triggered concerns from the IMF.⁵⁴⁶ Blockchain can provide unbanked people with digital wallets.⁵⁴⁷ Cryptocurrencies "present an opportunity for businesses to reduce their dependence on credit card companies."⁵⁴⁸

According to Senegalese singer Akon, in certain African villages, cellphone minutes are used as currency and are traded to buy groceries.⁵⁴⁹ This is a form of digital 'community currency' as a means of reducing poverty and bartering.⁵⁵⁰ Since they advance the common interest by developing a sense of community; and rely on collective action and personal management, these monetary systems fall under the common good framework.⁵⁵¹ Meyer & Hudon studied the notion of a 'new' commons which is found in the organizational sciences space.⁵⁵² New commons require collective-management, self-management, recognition of resources and social action. They found that social commons fit in the new commons and common goods frameworks.⁵⁵³ It is described as the ethics of residing in a setting where both flourishing individuals and groups are valued.⁵⁵⁴ Commercial commons, but not new commons,

542. Thomas Rid, et al., *Cyber Security and Emerging Technologies*, 58 SURVIVAL 188 (2016).

543. *Id.*

544. Manta & Pop, *supra* note 192, at 57.

545. Amit Chaturvedi, *Former US President Trump Says Bitcoin a 'Scam', Calls it Threat to Dollar*, HINDUSTAN TIMES, (June 8, 2021, 10:42 AM) <https://www.hindustantimes.com/world-news/former-us-president-trump-says-bitcoin-a-scam-calls-it-threat-to-dollar-101623120718832.html>

546. *Id.*

547. Blinder, *supra* note 40.

548. Mark R. Gleim & Jennifer L. Stevens, *Blockchain: A Game Changer for Marketers?*, 32 MKTG. LETTERS 126 (2021).

549. Ashwani Kumar, *Akon to Build Own Hi-tech City with Cryptocurrency*, KHALEEJ TIMES, (Jan. 14, 2020, 7:30 PM) <https://www.khaleejtimes.com/global-business/akon-to-build-own-hi-tech-city-with-cryptocurrency>.

550. Camille Meyer & Marek Hudon, *Money and the Commons: An Investigation of Complementary Currencies and Their Ethical Implications*, 160 J. OF BUS. ETHICS 290 (2019).

551. *Id.*

552. *Id.*

553. *Id.*

554. *Id.*

fit the common good.⁵⁵⁵ With the idea to elevate this concept, while participating in the 2020 Abu Dhabi Sustainability Week, Akon announced piloting the futuristic Akon City which will use cryptocurrency.⁵⁵⁶ Incorporating blockchain and the use of cryptocurrency into the development of smart cities can improve government management, support urban planning, and contribute to sustainability policies.⁵⁵⁷

Cryptocurrencies have potential to expand financial inclusion and create access to banking services.⁵⁵⁸ For example, in Bhutan, COVID-19 spotlighted the need to accelerate the digitalization of financial services to help vulnerable people build back.⁵⁵⁹ The UN Secretary-General's Task Force on Digital Finance of the SDGs seeks to empower citizens by aligning their currency with their needs.⁵⁶⁰ Maria Ramos, Co-Chair of the Task Force advocates that digitalization "extends the boundaries of financial inclusion by empowering citizens as savers, borrowers, lenders and taxpayers in a way that gives them choice and power over their money."⁵⁶¹ The growing use of cryptocurrencies innovates the traditional banking experience by utilizing the power of the community members as a group and helps with gaining sustainable economic independence.⁵⁶² Further, in a study of cryptocurrency in China, India, Nigeria and South Africa between 2009-2017, high levels of financial inclusion and the development of the financial sector are found in nations with increased cryptocurrency usage.⁵⁶³

In 2019, BanQu offered a 'non-cryptocurrency' blockchain platform for supply chain management.⁵⁶⁴ Its financial services are provided in partnership with a tax audit consulting firm RSM International.⁵⁶⁵ BanQu published a press release that it makes use of a distributed ledger of information for transparency in supply chain management that complies with the UN's SDGs.⁵⁶⁶ They claimed that they are focused on

555. *Id.*

556. Kumar, *supra* note 549.

557. Canadian Press, *supra* note 11.

558. Hughes, *supra* note 385, at 115.

559. Digital Finance Task Force, *supra* note 4.

560. *Id.*

561. *Id.*

562. Global Banking News, *Chaineum Launches Initial Coin Offering for Hush*, (Jan. 31, 2018).

563. Olusegun Vincent & Olaniyi Evans, *Can Cryptocurrency, Mobile Phones, and Internet Herald Sustainable Financial Sector Development in Emerging Markets?*, 24 J. OF TRANSNAT'L. MGMT. 271, 271 (2019).

564. PR Newswire, *BanQu Secures Partnership with RSM Spain to Bring Supply Chain Transparency, Traceability and Sustainability to Spanish and European Markets*, (May 17, 2019, 4:00 AM) <https://www.prnewswire.com/news-releases/banqu-secures-partnership-with-rsm-spain-to-bring-supply-chain-transparency-traceability-and-sustainability-to-spanish-and-european-markets-300852261.html>.

565. *Id.*

566. *Id.*

social justice and social responsibility by aiming “to help lift 100-million of the world’s 2.7 billion unbanked and underbanked people out of extreme poverty by 2023 through its unique blockchain platform.”⁵⁶⁷ Yet, it is unclear how the unbanked will receive banking services in a ‘non-crypto’ platform. Reza Lotfi of Yazd University, and a team of researchers, also developed a supply chain network design which applies block chain technology and cryptocurrency.⁵⁶⁸

Cryptocurrency serves areas where traditional banking cannot, and it has significantly reduced operational costs. In 2020, Lennix Lai, OKEx’s Financial Markets Director, advocated that Bitcoin is becoming more mainstream because he sees “the endorsement from global regulators,” its volatility is getting lower, and cryptocurrency is becoming an alternative asset to mainstream financing.⁵⁶⁹ Also, a surge of DeFi “reflects that people care starting to brace a free, open, permission-less financial system.”⁵⁷⁰ In 2015, Jason Brailow, a Bitcoin expert advocated that digital alternatives have the benefits of being low-cost, high-speed, private transactions easily accessed through the Internet.⁵⁷¹ Gavrilova notes that there are factors related to the digital new money which will result in weakened globalization processes including the decentralization movement and cryptocurrency’s transparency.⁵⁷² These factors will result in decreased costs in both government and banking supervision of monetary circulation.⁵⁷³ However, in 2022, Cathy Wood of the Ark Investment Management fund expressed concerns about cryptocurrency regulatory uncertainty.⁵⁷⁴ Ark sold some of its Coinbase holdings days after the SEC deemed some tokens listed on the Coinbase platform as securities.⁵⁷⁵ So, some Coinbase tokens would have to delist if Coinbase had not registered them with regulators and it was unclear how the Coinbase exchange would need to change if it did register these tokens.⁵⁷⁶

567. *Id.*

568. Reza Lotfi, et al., *Viable Supply Chain Network Design by Considering Blockchain Technology and Cryptocurrency*, MATHEMATICAL PROBS. IN ENGINEERING VOL. 2021, (2021).

569. PR Newswire, *supra* note 539.

570. *Id.*

571. Marketwire, *Bitcoin Expert Jason Brailow, Talks About the Future of Cryptocurrency*, (Jan. 30, 2015) <https://finance.yahoo.com/news/bitcoin-expert-jason-brailow-talks-003632546.html>.

572. Valeria Evgenievna Gavrilova, *Economics and Management in the Global World*, 2 GLOBALISM AND GEOPOLITICS, (2020).

573. *Id.*

574. Elaine Chen & Katie Greifeld, *Cathie Wood Says Regulatory ‘Uncertainty’ Spurred Paring of Ark’s Coinbase Stake*, BLOOMBERG, (Aug. 8, 2022, 1:32 PM) <https://www.bloomberg.com/news/articles/2022-08-08/cathie-wood-says-regulator-risk-spurred-paring-of-coinbase-stake?embedded-checkout=true>.

575. *Id.*

576. *Id.*

Further, with respect to economic development, as the unemployment rate in Nigeria remains unabated, a statistician Akinremi Oluwaseun became a crypto entrepreneur. He was a victim of a bitcoin scam and decided to launch his own as “many youths are already treading the path of crypto trading and exchanging.”⁵⁷⁷ Bitcoin is commonly used in Nigeria because “the Central Bank of Nigeria has decreased the value of the local currency significantly, meaning that many Nigerians found their overall wealth decreasing, even as prices have risen.”⁵⁷⁸ Fading trust in the Nigerian government and financial institutions has made cryptocurrency appealing.⁵⁷⁹

In addition, as per an Ariel investment and Charles Schwabb survey, to combat a mistrust of financial institutions and stock, young African Americans are embracing cryptocurrency.⁵⁸⁰ Blacks view the stock market as unfair and riskier while twenty three percent (23%) of Black investments voiced excitement about cryptocurrency as a way to start investing.⁵⁸¹ People’s desires to get rich quick are worrisome.⁵⁸² “One of the main motivations for investing in cryptocurrencies is that it seemingly allows average people to accumulate wealth and build their dream lives.”⁵⁸³ Cryptocurrency is more accessible than traditional banking.⁵⁸⁴ In September 2021, US Senator Pat Toomey, a ranking member of the Senate Banking Committee, also advocated for the growth of cryptocurrency and blockchain technology because “they have the potential to build wealth and financial independence for individuals who are empowered to engage in financial transactions directly with each other, free from oft-costly middlemen.”⁵⁸⁵ The “blockchain speaks to a deep human need, one of being able to trust other people, organizations and companies in a world where most our interactions are mediated and stored digitally.”⁵⁸⁶ People often describe cryptocurrencies as being free from government control, outside existing market and political systems.⁵⁸⁷

577. PM News, *How Nigerian Youths Can Attain Sustainable Financial Dream with Cryptocurrency - Oluwaseun*, (Feb. 2, 2021), at 18-20, <https://pmnewsnigeria.com/2021/02/02/how-nigerian-youths-can-attain-sustainable-financial-dream-with-cryptocurrency-oluwaseun/>

578. Ye, *supra* note 54.

579. *Id.*

580. Kelsey Butler, *Young Black Americans Wary of the Stock Market are Turning to Crypto*, BLOOMBERG (Apr. 5, 2022, 7:00 AM) <https://www.bloomberg.com/news/articles/2022-04-05/young-black-americans-wary-of-stock-market-are-turning-to-crypto?embedded-checkout=true>.

581. *Id.*

582. *Id.*

583. Ye, *supra* note 54.

584. *Id.*

585. Pensions & Investments, *News Roundup*, 49 PENSIONS & INV. 19, 19 (2021).

586. Cathy Mulligan, *Blockchain and Sustainable Growth*, 4 UN CHRONICLE (2018).

587. *Id.*

With regards to the unbanked as the result of war, is Russia's attack on Ukraine. "[A] collapsing ruble would drive Russians into cryptocurrencies such as Bitcoin."⁵⁸⁸ Jeremy Schwartz, the Global Chief Investment Officer of Wisdom Tree Investments stated that crypto gives Russians a location to keep their money and allows them to carry it with them if necessary.⁵⁸⁹ Yet, another concern is whether cryptocurrencies can be used to skirt US and NATO allies' sanctions against Russia. FTX's CEO Sam Bankman-Fried wrote that using cryptocurrency to avoid sanctions is difficult.⁵⁹⁰ Further, according to Ukraine's Deputy Minister of Digital Transformation, there has been \$50 million of inflows into Ukraine in donations via Bitcoin, Ether, Polkadot, Solana, Dogecoin and other cryptocurrencies.⁵⁹¹

9. Use of Crypto Stablecoins

Stablecoins are "[c]ryptoassets which are pegged to reserve assets such as the US dollar, in order to offer price stability."⁵⁹² Due to its fiat backing, stablecoins is prone to market fluctuations, purchasing power, and depreciation of the currency it is linked to. Interestingly, in 2019, Anchor was announced as a stablecoin claimed to be "pegged to the sustainable and predictable growth trend of the global economy."⁵⁹³ They peg it to the global economic growth using the Monetary Measurement Unit ("MMU") in its algorithm. This is a "non-flationary financial index created by an algorithm that tracks a series of macroeconomic indicators to provide the most accurate, available measure of real value that exists in the world today."⁵⁹⁴

In 2019, Facebook announced the creation of its own cryptocurrency called Libra. Libra is a stablecoin and a convertible cryptocurrency asset.⁵⁹⁵ At a 2019 press conference, Fed Chair Powell stated "we don't have plenary authority over cryptocurrencies" and that the Federal Reserve's role is to provide for consumer protection and to thwart money

588. Vildana Hajric & Akayla Gardner, *Staying Power of Crypto's Revived Refuge Status Faces Test*, BLOOMBERG, (Mar. 6, 2022, 9:00 AM), <https://www.bloomberg.com/news/articles/2022-03-06/staying-power-of-crypto-s-rediscovered-refuge-status-faces-test?embedded-checkout=true> .

589. *Id.*

590. *Id.*

591. *Id.*

592. Pete Cherecwich, *supra* note 470.

593. PR Newswire, *Anchor Stablecoin is Now Live and Available for Trading on IDEX Exchange*, (Aug. 26, 2019, 9:30 AM) <https://www.prweb.com/releases/anchor-stablecoin-is-now-live-and-available-for-trading-on-liquid-exchange-896967738.html>.

594. *Id.*

595. Bloomberg News, *Facebook's Libra Must be Under Central Bank Oversight, PBOC says*, BLOOMBERG, (July 8, 2019, 6:30 PM) <https://www.bloomberg.com/news/articles/2019-07-08/pboc-says-facebook-s-libra-must-be-under-central-bank-oversight?embedded-checkout=true>.

laundering.⁵⁹⁶ By June 2021, it was reported that Venezuela uses cryptocurrency to help handle hyper inflation.⁵⁹⁷ The country is allowing citizens to turn their currency bolivars into the Valiu stablecoins in a digital wallet in an attempt to enable merchants to accept these stable coins.⁵⁹⁸ In March 2022, President Nicolas Maduro announced “a 18-fold increase in Venezuela’s monthly minimum wage to roughly 126 bolivars (\$28) by pegging it to the value of half a petro, the government’s cryptocurrency.”⁵⁹⁹

The “wild swings in value can make it a risky, or profitable, venture.”⁶⁰⁰ In August 2021, MobileCoin raised funds to roll out its initial stablecoin and a MOBot cryptocurrency chatbot payment system.⁶⁰¹ As aforementioned, Stablecoins are cryptocurrency that is expanding quickly with value tied to traditional currencies. The market for Stablecoins exceeded \$2 trillion in April 2021; and by the end of July 2021, Yellen announced concerns about the rapid growth of stable coin and stated that it is unsupervised and needs new rules.⁶⁰² Further, in a US Congressional hearing, Federal Reserve Chair Jerome Powell said he had no intention to ban cryptocurrencies.⁶⁰³ Yet, stablecoins might be appropriate for regulation.⁶⁰⁴

IV. RECOMMENDATIONS

Many lessons are learned from this bibliometric critical appraisal. Can cryptocurrency platforms replace traditional banking? Perhaps, yes. Cryptocurrency seems to be a vibrant alternative to traditional

596. John Isige, “*We Don’t Have Plenary Authority Over Cryptocurrencies*,” *Fed. Chair Jerome Powell on Facebook’s Libra Regulation*, FXSTREET, (June 20, 2019, 10:32 AM) <https://www.fxstreet.com/cryptocurrencies/news/we-dont-have-plenary-authority-over-cryptocurrencies-fed-chair-jerome-power-on-facebooks-libra-regulation-201906201032>.

597. Bloomberg News, *Trailblazers Building a More Equitable, Sustainable World*, BLOOMBERG, (June 24, 2021, 11:01 PM) <https://www.bloomberg.com/news/articles/2021-06-25/new-economy-catalyst-four-trailblazers-building-a-better-world?embedded-checkout=true>.

598. *Id.*

599. Nicolle Yapur & Andreina Itriago Acosta, *Venezuela’s Maduro Announces 18-fold Increase in Minimum Wage*, BLOOMBERG, (Mar. 3, 2022, 7:16 PM) <https://www.bloomberg.com/news/articles/2022-03-04/venezuela-s-maduro-announces-18-fold-increase-to-minimum-wage?embedded-checkout=true>.

600. Gleim & Stevens, *supra* note 548, at 126.

601. Mobile Coin, *MobileCoin Raises \$66m in Series B Funding*, (Aug. 18, 2021) https://www.finmes.com/2021/08/mobilecoin-raises-66m-in-series-b-funding.html#google_vignette.

602. Pete Schroeder, *Yellen Urges Quick U.S. Adoption of Stablecoin Rules*, REUTERS, (July 19, 2021, 3:40 PM) <https://www.reuters.com/technology/yellen-says-us-must-move-quickly-establish-stablecoin-rule-framework-2021-07-19/>.

603. Vildana Hajric, *Bitcoin Posts Biggest Increase since July in a Matter of Minutes*, BLOOMBERG, (Oct. 1, 2021). *See also* Vildana Hajric, *Bitcoin Surges Past \$47,000 in Shock Rebound After a Grim Month*, BLOOMBERG, (Oct. 1, 2021).

604. *Id.*

banking when used for good to build a new, fairer economy. Here are 10 recommendations that should be taken into consideration when cryptocurrency policies and legal regulations are drafted:

1. Cryptocurrency companies should sign the Crypto Climate Accord.

Recall that the Energy Web Foundation, RMI, and Alliance for Innovative Regulation drafted a Crypto Climate Accord pledging to decarbonize the industry. Signatories pledge to set standards, achieve net-zero GHG emissions by 2040, and reach net zero emissions from electrical power use by 2030 and to develop standards toward the blockchain industry becoming 100% renewably powered by 2025. Gryphon signed the accord.⁶⁰⁵

2. Use renewable energy — wind, hydroelectricity, solar panels.

Companies that are using renewable energy for cryptomining include Harvest, Bitfarms, EDRCoin and Gryphon. In the great debate between Cathie Wood and Elon Musk, Cathie Wood has argued that several crypto mining companies are using renewable energy. The project *Harvest* in Berlin uses a 2-meter wind turbine to power a computer to mine cryptocurrency.⁶⁰⁶ The wind turbine puts out 700 watts of power at 24 volts. The mined cryptocurrency is used to fund climate change research.⁶⁰⁷ Regarding hydroelectricity, Bitfarms have used the town Sherbrooke in Quebec's hydroelectricity to help power its Bitcoin digital operations in Quebec.⁶⁰⁸ The town allows Bitfarms to use 98MWs for \$3 million a year from Bitfarm's Sherbrooke factory.⁶⁰⁹

EDRCoin uses solar panels' energy at independent private farms.⁶¹⁰ They also give back by donating 7% of their income to recover mangrove forests in Asia and the development of new solar powered plants.⁶¹¹ In 2018, Heisenberg Capital's founder Max Keiser stated that they saw early on that cryptocurrencies will require renewable energy for crypto mining such as solar energy.⁶¹² They support projects in the solar energy

605. PR Newswire, *supra* note 330.

606. Alfred Bayle, *supra* note 328.

607. *Id.*

608. Valiante, *supra* note 204.

609. *Id.*

610. M2PressWIRE, *The New Cryptocurrency EDRCoin Strives to Change the World for Better*, (Apr. 11, 2016).

611. *Id.*

612. Sun Exchange, *Crypto Power Couple, Stacy Herbert and Max Keiser join the Sun Exchange Advisory Board*, MEDIUM, (May, 30 2018) https://medium.com/@alias_73214/announcement-crypto-power-couple-stacy-herbert-and-max-keiser-join-the-sun-exchange-advisory-d0cf5482e62.

sector with a cryptocurrency based crowdfunding platform.⁶¹³ Also in 2018, Solar Alliance hired the celebrity actor William Shatner to help it market bitcoin miner rental space in a warehouse in Illinois that is powered with a 3MW solar panel array.⁶¹⁴ Shatner was a crypto critic but changed his stance to be a part of this renewable energy solution.⁶¹⁵ The problem with this business model is that miners request 20 to 100 MW according to the managing director of the Chelan County Public Utility District.⁶¹⁶ Further, in Africa, Water Pure International initiated a solar farm project for crypto mining. CleanSpark's goal is to make Bitcoin mining environmentally sustainable with renewable energy investments for 95% carbon free mining.⁶¹⁷

3. Use Carbon offsets.

In 2021, the crypto platform Gemini launched Gemini Green which purchases carbon permits for 350,000 metric tons of carbon to offset its use of the Bitcoin Network.⁶¹⁸ This is done in partnership with the University of Chicago's Climate Vault which facilitates "the purchase of carbon permits directly from government-regulated cap-and-trade markets and removed them from circulation. This prevents other market participants from using these carbon permits to emit CO2 and reduces the overall supply of carbon permits."⁶¹⁹

4. Reduce noise pollution.

There is an incredible amount of emphasis on reducing energy consumption. Yet, environmental sustainability includes the reduction of noise pollution. A problem with Bitfarm's Sherbrooke factory is that noise comes from large ventilators that keep the factories cool. Bitfarms proposed to build a 23-meter-tall wall as a sound barrier.⁶²⁰ Bitfarms makes use of Sherbrooke Quebec's hydroelectricity to help power its Bitcoin digital operations in Quebec.⁶²¹ The town allows Bitfarms to use 98MWs for \$3 million a year from Bitfarm's Sherbrooke factory.⁶²² However, noise comes from large ventilators that keep the

613. *Id.*

614. Jeremy Burke, *Shanter Once Called Bitcoin a 'Snob' Currency - Now He's Pushing Bitcoin Miners to Use Solar Power*, BUS. INSIDER, (June 15, 2018, 2:43 PM) <https://www.businessinsider.com/william-shatner-bitcoin-miners-solar-power-2018-6>

615. *Id.*

616. *Id.*

617. Mumford, *supra* note 349.

618. Global Banking News, *supra* note 416.

619. *Id.*

620. Valiante, *supra* note 204.

621. *Id.*

622. *Id.*

factories cool so Bitfarms proposed to build a 23-meter-tall wall as a sound barrier.⁶²³

5. Operate green data centers.

There was a report about innovative gas and bi-fuel systems usage at data centers. For example, gas systems can be deployed in parallel with the electricity grid 's power supply to cut down on data centers' use of electricity. Diesel substitutes that are sustainable can be used in facilities that are built near natural gas production zones.⁶²⁴ DMG Blockchain Solutions states that it has non-polluting data center operations by using mining powered by renewable energy.⁶²⁵ And China has made use of renewable energy to reduce electricity costs; water-based cooling; low-cost greenfield data center construction; and submarine cable deployments to connect China is increasing the high-performance data center market demand.⁶²⁶

6. Eliminate eco-scammers, frauds, fakes with regulations that require transparent reporting of energy consumption and methods to reduce energy waste.

7. Make use of crypto to cure unbankedness in developing and under-developed countries.

There are 2 billion people in under-developed countries that do not have access to traditional financial banking services because these services have high operational costs.⁶²⁷ "According to the World Bank, almost 35% of the world's population has no banking account."⁶²⁸ In a book review of Vigna & Casey's *The Age of Cryptocurrency: How Bitcoin and Digital Money are Challenging the Global Economic Order*, Rid noted that digital money could be quite appealing to the more than 2 billion people who lack access to banking services. Digital currency can help these people save money.⁶²⁹

623. *Id.*

624. PR Newswire, *The Data Center Generator Market is Expected to Grow at a CAGR of over 2% During the Period 2019-2025*, (Apr. 24, 2020, 04:03 PM) <https://www.prnewswire.com/news-releases/the-data-center-generator-market-is-expected-to-grow-at-a-cagr-of-over-2-during-the-period-20192025-301047039.html>.

625. Canadian Press, *supra* note 325.

626. PR Newswire, *supra* note 229.

627. PR Newswire, *supra*, note 624.

628. Kanegae et al., *supra* note 460, at 188.

629. Rid, et al, *supra* note 542.

8. Use crypto to fund environmental sustainability focused SMEs.

Recall that Palari Development is selling 3D printed housing to California buyers that pay using cryptocurrency or Bitcoin for their deposits. Palari's CEO stated that these buyers are tech-savvy millennials with a passion for sustainability.⁶³⁰ Millennials love online social, mobile, and digital portals. Donations via digital fundraising campaigns are popular. An example of an entrepreneurial endeavor is how the firm Digital Donations launched its own crypto coin and sought to raise \$5 million in Crowdfunder.⁶³¹

9. Use crypto to help the unemployed launch crypto based SMEs.

An example is as the unemployment rate in Nigeria remains unabated, a statistician Akinremi Oluwaseun became a crypto entrepreneur. He was a victim to a bitcoin scam and decided to launch his own. Several Nigerian youths are already using crypto trading and exchanges.⁶³²

10. Managers and leaders of cryptocurrency platforms need to create a sense of both a self-managed and collective-managed community.

Among the articles selected in this study, two emphasized the business ethics concept of "the commons." An example of nefarious behavior is discussed in Dallyn and Frenzel study of Faircoin and Faircoop. These were postcapitalist 'commons' which were designed as alternatives to capitalism. Commons are self-organized collectives of people sharing and governing resources.⁶³³ Commons are self-organized collectives of people sharing and governing resources.⁶³⁴ The common goods framework is in the business ethics space described as the ethics of a society whose aim is the personal and collective well-being and prosperity of its members. However, commercial commons, but not new commons, well represents the common good as a good fit.⁶³⁵

Faircoop was founded in 2014 as a Robinhood business model that was a financial cooperative unaffiliated with banks and was financed by several overdrafts in various banks across Spain.⁶³⁶ Faircoin gave

630. Dominion Post, *supra* note 239.

631. PR Newswire, *supra* note 450.

632. PM News, *supra* note 577.

633. Dallyn & Frenzel, *supra* note 252.

634. Meyer & Hudon, *supra* note 550.

635. *Id.*

636. Dallyn & Frenzel, *supra* note 252.

this movement scale with the use of cryptocurrency.⁶³⁷ Contrary to this, there is the news account of the entertainer Akon who participated in the 2020 Abu Dhabi Sustainability Week and announced piloting the futuristic Akon City which will use cryptocurrency.⁶³⁸ Incorporating blockchain and use of cryptocurrency into the development of smart cities can improve government management, support urban planning, and contribute to sustainability policies.⁶³⁹

V. CONCLUSIONS

This study provides a summary of 201 peer reviewed and grey news and magazine articles dated between Jan 1, 2013 and December 31, 2022 in order to make sense of what has been occurring with cryptocurrency over the past 10 years. The goal is to answer three research questions: (1) With respect to cryptocurrency, how can cryptocurrency mining be conducted in an environmentally sustainable manner?; (2) Can and should cryptocurrency replace traditional banking in a manner that fosters sustainable development?; and (3) What policies should be included in related cryptocurrency regulations? Regulators are urged to consider this information when establishing policies and legal regulations.

This study compares the concerns of critics with the benefits of cryptocurrency which are touted by proponents. Crypto mining uses powerful, energy intensive computer rigs. Critics span the gamut between governments such as China, Bangladesh, Bolivia and Paraguay; Elon Musk and BTS fans. While there is some merchant acceptance of cryptocurrency, there is a lack of mass merchant adoption. Perhaps if big tech companies such as Google, Facebook Amazon, and Microsoft played more of a role, mass adoption would happen. There is some movement by Facebook who has introduced the stablecoin Libra.⁶⁴⁰ However, Yellen has expressed a need for regulating the use of stablecoins. In addition, cryptocoin, market volatility and tech viability are concerns. Mining cryptocurrency requires technical experts skilled in blockchain development and experienced business governance. Yet, the cryptocurrency firms tend to have small numbers of employees and are not the type of job generators that government leaders seek out for economic development.

Since cryptocurrency firms like Celsius and Iris Energy have suffered due to market fluctuations and volatility, financial investment leaders

637. *Id.*

638. Kumar, *supra* note 549.

639. *Id.*

640. Bloomberg News, *supra* note 595.

such as Larry Fink of Black Rock, Mike Novogratz of Galaxy Digital, and Chris Heye of Wealthcare Planning have been critical. Yet, firms like Modular Asset Management advocates investing in cryptocurrency wisely using ESG factors as a guide.⁶⁴¹

Proponents at the country level of cryptocurrency include Australia, Iceland, Thailand, Malaysia and the United States. Local governments such as the City of Mobile Alabama in the United States and the City of Lugano in Switzerland are also proponents. This is important because since cities are crucial to climate action and there is evidence of an alignment between urban climate adaptation and sustainable and resilient development,⁶⁴² cities that advocate the use of cryptocurrency need to pay close attention to the energy consumed by crypto mining. The State of Wyoming tried to support cryptocurrency by deregulating power zones to get electricity at lower prices for cryptocurrency miners. Distributed ledger technology, like crypto, can be used to increase data transparency to verify transactions; for regulatory enforcement (esp. ESG related regulations); and to prevent greenwashing. To avoid the energy consumption issue, the use of renewable energy is an option. This includes wind turbines, hydroelectric power, natural gas and solar panels. In addition, smart grids can operate on crypto payments.

Cryptocurrency is also being used to fund environmentally friendly focused firms, such as Samantha Jones and the Sun Exchange. Cryptocurrency is being used to purchase environmentally friendly products. Yet, greenwashing is a concern since a number of new businesses claim to be environmentally friendly but are not being very transparent about saying in what way they are reducing energy consumption.

Further, there is movement toward shifting from the PoW to more environmentally friendly consensus mechanism such as PoS and other alternatives. The company Apollo claims that the use of sharding eliminates wasteful blockchain bloat, data use and storage which can be an energy saver.⁶⁴³ The impact of cryptocurrency mining on the environment is also a concern with retirement investments. Just as Modular Asset Management advocates using ESG factors in deciding on buying cryptocurrency, in the United States, the Biden administration put forth a rule that permits retirement plan fiduciaries to take climate change and other ESG considerations into account when selecting assets to invest in.⁶⁴⁴ This impacts cryptocurrency related retirement investments.

641. Ossinger, *supra* note 281. Ossinger, *supra* note 282.

642. Saebom Jin, et al., *Empirical Evidence of Urban Climate Adaptation Alignment with Sustainable Development: Application of LDA*, 136 *CITIES* 104254 (2023).

643. Capelj, *supra* note 445.

644. Croce, *supra* note 399; Iacurci, *supra* note 400.

Cryptocurrency firms are also providing ways to track carbon asset management for environmentally sustainable efforts. Do gooders (in the environmental space or volunteer emergency responders, for example) can get rewarded in cryptocurrency. Cryptocurrency is also being accepted as donations to fund environmentally social groups and to raise funds for government infrastructure projects. There is movement toward making the use of cryptocurrency more mainstream by conducting cryptocurrency mining in malls and in museums using renewable energy. Cryptocurrency mining firms are being encouraged to sign a Crypto Climate Accord.

Further, El Salvador, Nigeria and Senegal are making use of cryptocurrency to thwart unbankedness. The higher use of cryptocurrency is resulting in higher financial inclusion. Ukrainians and Russians are using cryptocurrency during their war for donations, savings, and purchases.

In alignment with the findings of this bibliometric systematic literature review, the following ten (10) recommendations are made herein for policies and legal regulations related to cryptocurrency mining: (1) cryptocurrency companies should sign the Crypto Climate Accord; (2) require the use of renewable energy for mining; (3) require the use of carbon offsets; (4) require that mechanisms be put in place to reduce noise pollution; (5) require the use of green data center operations; (6) eliminate eco-scammers, frauds, fakes with regulations that require transparent reporting of energy consumption and methods to reduce energy waste; (7) make use of crypto to cure unbankedness in developing and under-developed countries; (8) use crypto to fund environmental sustainability focused SMEs; (9) use crypto to help the unemployed launch crypto based SMEs; and (10) require that managers and leaders of cryptocurrency platforms create a sense of both a self-managed and collective-managed community.

In conclusion, with proper policies and legal regulations, by using digital financial technologies, conventional community financial institutions and traditional currencies can morph. Money has morphed. Digitalization and AI are unleashed Genies that were in a bottle. As Cathie Wood of Ark Investment advocates, we are not going back to the old world.⁶⁴⁵ There is no turning back. In fact, the US SEC's approval of the new spot Bitcoin ETFs will likely result in an increase of crypto mining and heightened concerns. Financial institutions can continue to be important in the face of developments in digital assets and cryptocurrencies that advance into service and support for these new assets and currencies by using effective, simple, and affordable tactics

645. Massar, *supra* note 28.

and technologies. Banking may become more inclusive, community-focused, and ecologically friendly by putting the advice from this bibliometric study into practice.