# Blockchain Technology for Good

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## Article

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Abstract

The evolution of blockchain technology as a foundational and transformational technology helps solve critical societal problems. Blockchain technology enables sustainability-focused blockchain initiatives to achieve their social and public welfare objectives. The author discusses the synthesizing properties of blockchain technology that can help overcome the age-old debate between socialism and capitalism and introduce forms of decentralism as a synthesis. Using a dataset of sustainability-focused blockchain initiatives, blockchain startups, and established businesses, the article evaluates the core transformational features of blockchain technology and their impact on humanity.

*Key Words:* Sustainability, Environment, Social Good, Social Justice, Society, Social Causes, Assets, Blockchain, Startup, Decentralized Commerce, Reputation Verification, Emerging Technology, Crypto Economics, Token Models, Incentive Design, Tokens, Equity, Distributed Ledger Technology, Blockchain Technology, Artificial Intelligence, Robotics, Machine Learning, Big Data

*JEL Categories:* K20, K23, K32, L43, L5, O31, O3



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## I. Introduction

The evolution of blockchain technology as a foundational and transformational technology helps solve critical societal problems. Blockchain technology enables sustainability-focused initiatives to achieve their social and public welfare objectives through autonomous and anonymous uncoordinated collective action for the greater good. While centralized common good coordination of human behavior risks can undermine individual effort, blockchain technology's autonomous and anonymous decentralized network coordination of individual human action can help overcome the threat to individualism and its welfare-enhancing effects.

Blockchain is a foundational and transformational technology that has the potential to fundamentally improve societal outcomes. Such technologically driven benefits have not been possible in legacy systems.[1] On a very rudimentary level, blockchain's public interface is made up of a mere string of timestamped, immutable, and shared data. The peer-to-peer interactions and transactions in a decentralized network, where all participants are equal and verification and validation of each transaction is provided by all parties in the network through the blockchain technology, provide near unlimited

1. *See generally* William Mougayar, *The Blockchain is the New Google*, TechCrunch (May 11, 2016, 7:30 PM), https://techcrunch.com/2016/05/11/the-blockchain-is-the-new-google; Michael Crosby et al., Sutardja Ctr. for Entrepreneurship & Tech., Blockchain Technology Beyond Bitcoin 3 (Oct. 16, 2015), http://scet.berkeley.edu/wp-content/uploads/BlockchainPaper.pdf; Cognizant, Marketforce, and Pegasystems, The Future of Retail Financial Services 6, 28–30 (2016), https://www.pega.com/sites/pega.com/files/docs/2016/Jan/the-future-of-retail-financial-services-study.pdf; John Naughton, *Is Blockchain the Most Important IT Invention of Our Age?* The Guardian (Jan. 24, 2016, 4:00 AM), https://www.theguardian.com/commentisfree/2016/jan/24/blockchain-bitcoin-technology-most-important-tech-invention-of-our-age-sir-mark-walport; Kyle Torpey, *Why the Bitcoin Blockchain Is the Biggest Thing Since the Internet*, Nasdaq (Apr. 19, 2016, 9:32 AM), http://www.nasdaq.com/article/why-the-bitcoin-blockchain-is-the-biggest-thing-since-the-internet-cm608228; Carrie Kirby, *Andreessen at CoinSummit: Bitcoin Today is the Internet in 1994*, CoinDesk (Mar. 25, 2014, 3:21 PM), http://www.coindesk.com/marc-andreessen-balaji-srinivasan-discuss-bitcoin; Dinis Guarda, *Over 50 Bitcoin and Blockchain Thoughts and Quotes You Need to Read*, tradersdna (July 4, 2016), http://www.tradersdna.com/bitcoin-and-blockchain/over-50-bitcoin-and-blockchain-thoughts-and-quotes-you-need-to-read; Rich Daly, *Blockchain: Wall Street's Most Game-Changing Technology Advance Since The Internet*, Forbes (July 11, 2016, 6:00 AM), https://www.forbes.com/sites/richdaly/2016/07/11/blockchain-wall-streets-most-game-changing-technology-advance-since-the-internet/#33987a154d87.

opportunities and applications.[2] The technology incentivizes direct transactions, including compensation, between the creator and consumer, eliminating the need for intermediation.[3]

Blockchain technology has been defined in many different ways, and no truly uniform definition seems to exist. Some refer to it as a giant worldwide distributed, immutable "Google spreadsheet" for transactions.[4] Others define blockchain by focusing on its central elements, e.g., it is a transaction ledger, electronic, decentralized, immutable, and provides cryptographic verification, among several other elements.[5]

Blockchain technology's features enable its transformative capabilities. Through its formal immutable guarantees, improved data ownership, transparency, network integrity, and data privacy, blockchain technology facilitates unprecedented trust that helps to optimize business and society. The decentralized, fully distributed nature of the blockchain makes it practically impossible to reverse, alter, or erase information on the blockchain, making it immutable.[6] The technology lowers costs in orders of magnitude and enables a substantial increase in efficiency. Power is exercised by way of blockchain's consensus protocol. The consensus protocol enables the control of data by multiple networked parties. It facilitates a system of

2. For instance, in the financial world, a global consensus record of information and transactions creates the much-needed transparency and, at the same time, opens global access to finance, including in areas of the world where the banking system—in contrast to a mobile telephone network—is not readily available. *See, e.g.*, Michele Chandler, *Mobile Banking Takes Off in Nigeria*, STANFORD GRADUATE SCH. BUS. (Jan. 24, 2012), https://www.gsb.stanford.edu/insights/mobile-banking-takes-nigeria; Cade Metz, *Why Bitcoin Will Thrive First in the Developing World*, WIRED (Feb. 2, 2016, 8:00 AM), https://www.wired.com/2016/02/why-bitcoin-will-thrive-first-in-the-developing-world (noting that in Nigeria, for example, banking transactions are readily executed over mobile phones because no infrastructure exists for consumer banking. Donations and aid to third world countries can finally be provided without the interference of suboptimal bureaucratic organizations that don't allocate the aid as intended by the donor.).

3. René Bader & Thorsten Deckers, *How Does Blockchain Work? Transactions Without an Intermediary*, ISBUZZNEWS (Apr. 6, 2017), http://www.informationsecuritybuzz.com/articles/blockchain-work-transactions-without-intermediary; Jill Richmond, *How Blockchain Is Transforming the Creative Industry*, NASDAQ (Apr. 26, 2017, 8:25:46 PM), http://www.nasdaq.com/article/how-blockchain-is-transforming-the-creative-industry-cm780005.

4. Jonathan Shieber, *Colu Aims to Bring Blockchain Technology Everywhere*, TECHCRUNCH (Jan. 27, 2015), https://techcrunch.com/2015/01/27/colu-aims-to-bring-blockchain-technology-everywhere.

5. *See, e.g.*, DELOITTE, BLOCKCHAIN ENIGMA. PARADOX. OPPORTUNITY 4–7 (2016), https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/Innovation/deloitte-uk-blockchain-full-report.pdf; ALAN MORRISON, BLOCKCHAIN AND SMART CONTRACT AUTOMATION: BLOCKCHAINS DEFINED (2016), http://www.pwc.com/us/en/technology-forecast/2016/blockchain/pwc-smart-contract-automation-definition.pdf; Alistair Dabbs, *What Is Blockchain, and Why Is It Growing in Popularity?*, ARSTECHNICA (Nov. 6, 2016, 8:00 AM), https://arstechnica.com/information-technology/2016/11/what-is-blockchain; Lee Grant, *Blockchain – Definition, Origin, and History*, TECHBULLION (Sept. 6, 2016), http://www.techbullion.com/blockchain-definition-origin-history.

6. Antony Lewis, *A Gentle Introduction to Immutability of Blockchains*, BITS ON BLOCKS (Feb. 29, 2016), https://bitsonblocks.net/2016/02/29/a-gentle-introduction-to-immutability-of-blockchains.

checks and balances that prohibits any vested interest and control of the system.

Because of the core features of blockchain technology, blockchain-based business models are ideally positioned to contribute to and enhance social good and sustainability in society. Blockchain technology and business models enabled by blockchain technology have the capacity to solve many existing problems afflicting society and undermining societal improvements. The enhanced trust provided by the technology enables business models that especially focus on business and societal functions that depend on trust, morality, and ethics. For example, several startups are examining the ability of blockchain technology to facilitate quasi-governmental functions, such as a voting record, birth registry, default currency, among many other examples, including health care record keeping and transfers.

Social good and sustainable societal functions of blockchain technology are associated with the societal changes that are enabled by the technology. As the technology increasingly fulfills business and societal functions, society may increasingly emerge with social good and sustainable elements that derive from less ownership, more value and goal focused work, less rent-seeking behavior, more connectivity, more freedom of choice, fewer hierarchies, fewer geographical limitations, and less consumerism. The overall effect of decentralized technology-based solutions will likely involve a higher overall trust throughout society as negative effects of untrustworthy centralized intermediations are increasingly replaced with the trusted guarantees of decentralized technologies.

The technology's fraud protection features provide another prominent example of its social good and sustainability functions. Blockchain technology's decentralized network connectivity via the Internet enables protection against fraud.[7] Transparency is a key feature to protect against fraud. Blockchain's network connectivity allows multiple copies of the blockchain to be visible and available to all participants across the distributed network. In the distributed consensus model, individual network nodes verify and validate chain transactions before the execution of the transactions, making it extremely rare for a fraudulent transaction to be recorded in the blockchain.[8] The consensus algorithm allows node verification of transactions without compromising the privacy of the parties. Consensus algo-

7. For an in-depth, nuanced discussion of this point, see PETER VAN VALKENBURGH, OPEN MATTERS: WHY PERMISSIONLESS BLOCKCHAINS ARE ESSENTIAL TO THE FUTURE OF THE INTERNET 3–4, 23–26 (2016), https://www.coincenter.org/app/uploads/2020/05/openmattersv1-1.pdf.

8. *See, e.g.*, Razvan Peteanu, *Fraud Detection in the World of Bitco*in, BITCOIN MAG. (Mar. 26, 2014, 5:50 AM), https://bitcoinmagazine.com/articles/fraud-detection-world-bitcoin-1395827419; Francois Janinotto, *The Blockchain Explained to Web Developers, Part 1: The Theory*, MARMELAB BLOG (Apr. 28, 2016), https://marmelab.com/blog/2016/04/28/blockchain-for-web-developers-the-theory.html.

rithms are, therefore, arguably safer than a traditional model that requires third-party intermediary validation of transactions.[9]

This article provides an overview of blockchain for good projects, e.g., technology driven projects that serve the greater good of humanity through the utilization of blockchain technology, in the 2020s. The author discusses the synthesizing properties of blockchain technology that can help overcome the age-old debate between socialism and capitalism and introduce forms of decentralism as a synthesis. The author created a proprietary dataset of blockchain for good projects and presents key findings.

## II. Blockchain for Good

Blockchain for good projects come from a wide variety of backgrounds and often differ strongly in the expectations and intentions of their members. Yet, the uniting force for all these projects is the desire to use emerging technology to create a better world.

### *1. Transcending Socialism and Capitalism*

Blockchain for good projects are often conscious of the need to create new solutions that are not afflicted with existing notions of politics that go back to the underlying principles of capitalism and socialism. The tension between socialist and capitalistic principles for the organization of society has undermined societal goals for the betterment of humanity for centuries. In the twentieth and twenty-first centuries, human society and economic systems have revolved around, and evolved from, political and economic doctrines that seek to organize society effectively and allocate resources efficiently for the betterment of humanity. Society is organized around the dichotomies between capitalism and socialism and has formed power structures and political hierarchies to serve their respective underlying ideologies.

Differences between socialism and capitalism manifest themselves in almost all metrics of societal organization. Very few societies are exclusively run based on either capitalistic or socialistic doctrine. Rather, policy in a given society is an amalgamation of capitalistic ideas and socialistic ideas. The degree of capitalistic ideas versus socialistic ideas in a given society materialize through its adherence to basic metrics. Such metrics may include notions of ownership, equality, the role of government, markets, prices, efficiency, taxes, and healthcare, among many others.

9. For a discussion of privacy on the blockchain, see Van Valkenburgh, *supra* note 7, at 33–40. For an overview of various consensus mechanisms see Sigrid Seibold & George Samman, Consensus: Immutable Agreement for the Internet of Value (2016), https://assets.kpmg.com/content/dam/kpmg/pdf/2016/07/kpmg-blockchain-consensus-mechanism-channel-islands.pdf; Van Valkenburgh, *supra* note 7, at 15–40.

Common differentiators between socialism and capitalism can help create the consensus for change that may be enabled by emerging decentralized technologies. Where capitalism sees ownership as assets that are owned by private individuals and firms, socialism suggests assets should be owned by cooperatives and by the government. A core difference between socialism and capitalism revolves around efficiency. Whereas capitalism suggests that market incentives encourage firms to cut costs and increase efficiency of operations, socialism is less focused on notions of efficiency, as government-owned firms have fewer incentives to increase efficiencies that create economies of scale. Where capitalism sees equality created by markets and income determined by market forces, socialism holds that private income should be redistributed by a strong government to ensure equality of its citizens. Similarly, taxes in capitalist governments are minimized to limit government spending, whereas socialist systems typically have high progressive taxes combined with higher spending on public services. Prices in capitalism are determined by market supply and demand, whereas prices in socialism are subject to governmental price controls.

Blockchain for good projects often realize that the long-lasting debate on benefits and detriments of capitalism and socialism is largely pointless. Capitalism has advantages through a dynamic economy and strong incentives for innovation and economic growth. By contrast, socialism has significant strengths in the context of the promotion of equality and its attempts to overcome market failure. Negative outcomes of capitalism and socialism are equally bountiful. Capitalism can lead to significant inequities, inequality, as well as monopolies, and other market failures. Similarly, socialism has significant incentive design issues, where hard work is not rewarded effectively, and external costs are largely ignored. More socialist systems are afflicted with significant inefficiencies of state-run industries.

Blockchain for good projects often believe in decentralization as the antidote to overcome the problems associated with socialism and capitalism. Decentralization via blockchain technology transcends notions of socialism and capitalism. Decentralization posits that centralized coordination of societal and economic activity, as instituted and instantiated in capitalistic or socialistic doctrine, should be held to a minimum in order to free the human potential and improve society.

Blockchain technology enables a form of technology-enhanced individualism that builds on and reforms society's existing infrastructure. Where the dichotomies between capitalism and socialism focus on ownership as assets that are owned by either private individuals and firms (capitalism) or by cooperatives and the government (socialism), decentralism calls the concept of ownership into question and focuses on the largest possible utility of assets for humankind.

Decentralization via blockchain technology has the potential to create an alternative societal order. Where the dichotomies between capitalism and

socialism focus on efficiency, that is, whether market incentives encourage firms to cut costs and increase efficiency of operations (capitalism) or the government-owned firms have fewer incentives to increase efficiencies that create economies of scale (socialism), decentralism creates efficiency not in linear forms but via higher levels of connectivity. Where the dichotomies between capitalism and socialism see equality created by markets and income determined by market forces (capitalism) or holds that private income should be redistributed by a strong government to ensure equality of its citizens (socialism), decentralism creates higher levels of equality in society through the preservation of diversity of content, diversity of data sources, and enhanced node connectivity. Where the dichotomies between capitalism and socialism debate equitable redistribution by either curtailing taxes to limit government spending and economic growth (capitalism) or by increasing progressive taxes combined with higher spending on public services (socialism), decentralism's redistribution is based on ownership rights in persons' individuality-derived data that creates economic value.

Decentralism focuses on growth through network effects rather than through private rent-seeking or government intervention in markets. Because decentralism builds on and reforms society's existing tax-based infrastructure, it calls the traditional concept of ownership into question, and focuses on the largest possible utility of assets, taxability of traditional assets and income is less relevant. Where capitalism is focused on economies of scale, maximum production, and economic growth, socialism is often seen as the antithesis with more focus on long-term sustainable economic solutions through planning economies. By contrast, decentralism is less concerned with economic growth through per unit cost reduction, economies of scale, and the associated negative externalities, but rather is focused on connectivity and growth through network effects, e.g., the more users of a given technology the greater the benefit to each individual user of being able to use the network. As such, negative externalities are minimized without centralized planning.

The transcendental nature of blockchain technology manifests itself through the instantiation of its core features in different systems and contexts. For example, technology is largely limited by the control of corporations (capitalism) or governments (socialism). By contrast, in decentralism, technologies are mostly shared to create the best solutions for humanity and are not owned and controlled. The open-source movement, in its purest form, provides an example of the power and use of technology for the greatest utility of humanity. Similarly, the arts and sciences are subject to the limitations of monetary quantification in both capitalism and socialism. By contrast, because the arts and sciences help proliferate unique skillsets and diversity of opinions, decentralism values the arts and sciences disproportionately. Human rights, access to resources, sustainability, freedom, peace, and prosperity are also protected at different levels in capitalistic or social-

istic societies. The highest protection of human rights, access to resources, sustainability, freedom, peace, and prosperity around the globe is universally emphasized in the technology-enhanced individualism of decentralism as each ensures the foundations of human input into decentralized systems.

As compared with capitalism and socialism, the role of trust is different in decentralism. In capitalism, trust in the system is generated through trusted intermediaries and checks and balances. Trust in socialism is created through belief in the infallibility of government. By contrast, decentralism posits that trust in the system should not be controlled by corruptible human constructs and institutions that are controlled by a limited number of fallible and corruptible humans. Rather, trust in decentralism is based on technology-enhanced individualism. Trust depends on technology-facilitated collective human action and as such belongs to the majority, incorruptible by fallible individual action. Trust in capitalism and socialism is partially created by legal guarantees and by a judicial system that enforces such legal guarantees. Legally created trust is often limited as it can be arbitrary because it is only indirectly democratically legitimized, inflexible, untimely, resistant to change, with fallible human-centric decision processes, and human speed. Trust in decentralized legal solutions can be more democratically legitimized through microdemocratic, individualistic yet technology-centric autonomous decision processes, coded guarantees, and machine speed.

Decentralism allows society to reevaluate its forms of organization and production. Decentralized systems use elements of profit generation and redistribution in a way that in effect combines capitalistic and socialistic ideas. Decentralism allows for the organization of society in economic structures that generate profits while at the same time redistributing resources. For example, decentralized autonomous organizations combine elements of socialistic cooperatives with the meritocracy and incentivization of capitalism. Another example is provided by the ability to sell one's personal data (e.g., social media consumption), preferences, opinions, etc. in decentralized systems, including in real time. Such assets can only limitedly be commercialized in existing centralized structures. In decentralized structures, such assets can be tokenized, valued, and mobilized. Similarly, hard assets, such as real estate, can be tokenized and sold in unprecedented fractional forms. The ability to control one's data and fractionalized (hard) assets enables new forms of consumption for consumers. In early 2020, several startups were developing a barter system in which services, such as free car rides, become available in return for disclosure of consumers' data and personal preferences, etc.

### *2. Microdemocracy*

Microdemocratic principles inherent in blockchain technology can help overcome the existing challenges of representative democracies. For exam-

ple, internet-based technology and proper technological incentivization can increase currently lacking voter participation that undermines representative democracies.

Experimentation with electronic means of voting allows new forms of allocating votes to prioritize societal issues for each voter. Quadratic voting,[10] for example, allows a first glimpse of what may be possible in microdemocratic voting structures. Each voter in a given microdemocratic voting scenario may be allocated a maximum number of votes. Such votes may be allocated by priority to any issues the respective voter wants to engage with. The more important a given societal issue is for a voter, the more votes the voter will allocate to the issue. For example, as more and more people become aware of the climate crisis faced by humanity, they will increasingly allocate their votes on issues that reflect their increasing awareness. Change thus becomes tangible as people allocate their votes prioritized by their then-existing preferences and awareness. Similarly, if a voter is particularly affected by the erection of a nuclear power plant in their backyard, they are able to allocate all of their votes for or against such erection.

This microdemocratic approach allows the voter to exercise their maximum voting power to the issue most relevant to such voter. Moreover, part of the power of this microdemocratic approach derives from the higher levels of knowledge a given voter has on a particular issue that is evidenced by the voter's proportional allocation of votes on such issue. It is less likely that voters will allocate number one priority to issues they know relatively little about. Voting outcomes and their application and relevance to a given constituent are thus presumably improved.

Microdemocratic processes permit vote delegation in representative democratic processes. Knowing the significance and power of their total amount of available votes, constituents may decide to delegate voting power to a selected representative. Delegation in this system is likely to be based on the actual knowledge of such representative and her respective skillsets, ethical record, and trustworthiness, which can further improve voting outcomes. For example, a voter may recognize that she has insufficient knowledge about an issue that is very close to her heart. This may trigger her desire to make the acquaintance of a potential representative with a higher level of knowledge about the particular issue she cares about. She will typically select an individual with high levels of knowledge and who has a reputation in the community for being highly trustworthy and knowledgeable. Yet, the delegation of voting power inevitably allows the corruptive element back into the system as certain representatives may wish to bribe or purchase votes to provide them with more power in the system.

10. ERIC A. POSNER & E. GLEN WEYL, RADICAL MARKETS (2018).

Delegation of votes necessitates a policing system to avoid the corruptive elements.

Microdemocracies would need to address the problem of the tragedy of the commons. The concept of the tragedy of the commons describes the downsides of a microdemocratic shared-resource system for the common good of the society. In microdemocratic systems, individual voters act independent of the totality of voters according to their self-interest. Acting for their own self-interest may be contrary to the common good of all voters. Without controls, some self-interested voters may be depleting or spoiling resources they share with the rest of society, such as the environment, public goods, and others. Similarly, majority rule may mean discrimination of the minority. A majority that is unaffected by a rule they instantiate may have a discriminatory impact on a minority that is disproportionately affected by the change in the rules.

A key advantage of a microdemocracy based on blockchain technology is the speed of change it can initiate. Now, in the early 2020s, representative democracies are largely slow and inflexible because of their constitutional and institutional infrastructure and their respective legal systems. Change typically depends on the election of a new government after around four years at the earliest. By contrast, microdemocratic voting would allow a more immediate feedback system between voters and their representatives. Because blockchain technology enables the incorruptible counting and tallying of votes instantaneously, voting can be more dynamic and incremental, and political will is exercised more directly.

Decentralized technologies provide inherent microdemocratic features that can help instantiate microdemocratic principles and processes in society. Decentralized technologies can help bring more direct microdemocratic representation to society. Decentralized technology enables smaller scale democratic decisions at unprecedented scale. In the early twenty-first century, internet-platform businesses and social media companies inaugurated new forms of voting. The "Like" button, while deeply flawed in its incentive design and voting-related outcomes, inaugurated a new form of voting on social outcomes and, at the same time, trained the voting public to engage more directly with voting related outcomes. Decentralized technologies create extensions of these forms of more direct democratic votes. Unlike their centralized predecessors, decentralized technologies, for the first time in history, enable improved incentive designs that help overcome the insufficiencies in voting outcomes of representative democracies.[11] As voting pools in decentralized systems increase, deepen, and proliferate, they can become supplemental voting systems that help overcome the lack of legitimacy and improve representative democracies. Of course, such up-

11. For more details see CRAIG JAMES CALCATERRA & WULF ALEXANDER KAAL, DECENTRALIZATION (2021), https://www.degruyter.com/document/isbn/9783110673937/html.

grades to existing representative democracies may require constitutional or democratic support which is dubious at best.

Decentralized technology can improve voting technology in representative democracies. Voting technologies in existing representative democracies were woefully outdated at the beginning of the twenty-first century. Since *Gore vs. Bush*,[12] which necessitated reexamination of punch holes in paper voting cards, existing voting systems with analog or paper technology have been proven suboptimal. But the problems with existing voting systems do not stop with technology. Redistricting, that is, changing the demarcation of a given voting district to adjust to voter preferences therein and change overall voting outcomes, and other basic democratic voting-related issues, show that voting and the democratic institutions built to facilitate basic tenets of representative democracies have been under attack and require updates. Decentralized technologies have technological features that can provide solutions. But such solutions also require political will. For example, voting on a public blockchain that overcomes the trilemma of blockchains (decentralization, scaling, security)[13] may become a core application of the technology. Yet, governments in the existing representative democracies may not wish to surrender control over the voting process and may prefer to use private blockchains to facilitate voting outcomes.

Centralized technology companies increasingly act like governments. For example, Microsoft announced in January 2020 that it would open a representation to the United Nations.[14] In 2020, executives of the top technology companies were added to the list of attendees at the annual security conference, a position that was previously reserved exclusively for presidents, prime ministers, and politicians. Regulating the increasing power of centralized technology conglomerates only addresses part of the issues. Even if fully regulated, centralized technology conglomerates still have the power to set standards and norms for emerging technologies that government cannot effectively trace. Microdemocratic decision making helps set such standards outside of the control metrics imposed by the centralized technology conglomerates.

### *3. Leapfrogging*

Developing and emerging countries have a significant opportunity to benefit from blockchain technology.[15] When the blockchain-based smart contracting infrastructure evolves, the resulting disintermediation will allow

12. Bush v. Gore, 531 U.S. 98 (2000).

13. In 2021 no public prochain existed that accomplishes all three of these requirements fully and at the same time: decentralization, scaling, security.

14. Marietje Schaake, Opinion, *Technology Companies Want to Act Like Governments*, FIN. TIMES, Feb. 21, 2020, at 9.

15. Vermeulen – Medium – on UN Charter initiatives for Blockchain tech in developing countries.

consumers to connect with each other peer-to-peer with no transaction costs. The blockchain-enabled peer-to-peer economy will help open previously underdeveloped or non-existing industries, new technologies, and a vast amount of new employment opportunities.

Unlike developed countries, third world and developing countries will likely be enabled by blockchain technology to leapfrog several stages of development, otherwise necessitated in existing legacy systems. Fintech startups, e.g., financial technology startups that disintermediates banks, leverage technology to improve the quality of, and access to, financial services for individuals in markets that have traditionally been excluded from such markets. Blockchain-based services are a part of this evolution that benefits developing countries. Other examples include startups working on blockchain systems that maintain land title records data. Such blockchain title data can serve as collateral for accessing credit or verifying identities, which is often a challenging and prohibitive requirement for accessing both financial and non-financial services.

## III. Blockchain for Good Projects

### *1. Introduction*

Core constituents of blockchain for good projects include social activists, socially conscious people, the poor, indigenous people, cultural creatives, climate change and environmental activists, the unbanked, the open-source movement, the open-value movement, permaculture, volunteer, and non-profit communities.[16] Cultural creative individuals are defined by a set of values, their lifestyle, and their worldview. Cultural creatives often follow a lifestyle of health and sustainability (LOHAS). They feel all humans are members of one planet and are concerned about the environment and social-economic justice. More than three billion people around the world are concerned about global climate change, with the highest concern coming from the regions of Latin America and Africa.

According to the United Nations, there are an estimated 370 million indigenous peoples worldwide. They are concerned about Mother Earth and her well-being and the protection of the waters and the land for future generations. Indigenous people are very spiritually attached to the earth, and most of them still live on their native land. Indigenous people are often semi-autonomous; this means most of them can write their own laws.

### *2. Data*

The author worked with a group of research assistants to compile a list of blockchain for good projects (n=33). The researchers reviewed the

16. World Bank, Annual Report (2015), https://www.worldbank.org/en/about/annual-report-2015.

whitepapers of each project and categorized identified projects into objective buckets, among other criteria. This allows an objective evaluation in graph format.

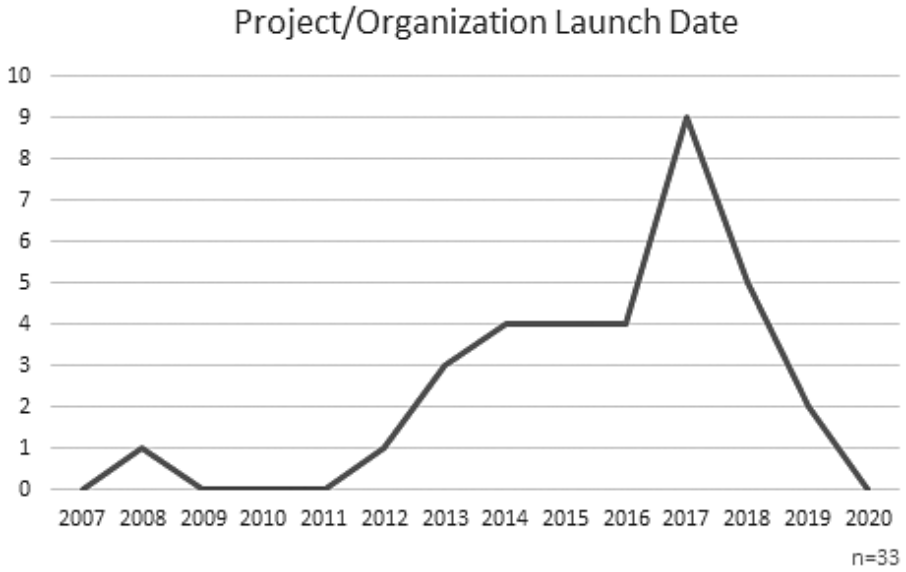


Figure 1: The rise and fall of blockchain for good projects. N=33.

Figure 1 shows that blockchain for good projects proliferated between 2013–17 and peaked in 2017. Many of the projects in the dataset did not launch successfully or perished over time. For example, GiftCoin, a charitable donation tracking project, was launched in 2017 with an initial coin offering expected to launch in March 2018,[17] which shut down in June 2018.[18] Regulatory concerns and lack of confidence in the market were cited as reasons for postponing the sale.[19]

17. GIFTCOIN, WHITEPAPER V1.4 (2017) https://www.promisegiving.com/GiftCoin_Whitepaper.pdf.

18. Kirsty Weakley, *Crypto Donation Platform Halts Token Sale and Returns Funds to Investors*, CIVIL SOCIETY NEWS (Jun. 19, 2018), https://www.civilsociety.co.uk/news/crypto-donation-platform-postpones-token-sale-and-returns-funds-to-investors.html.

19. *Id.*

*3. Use Cases*

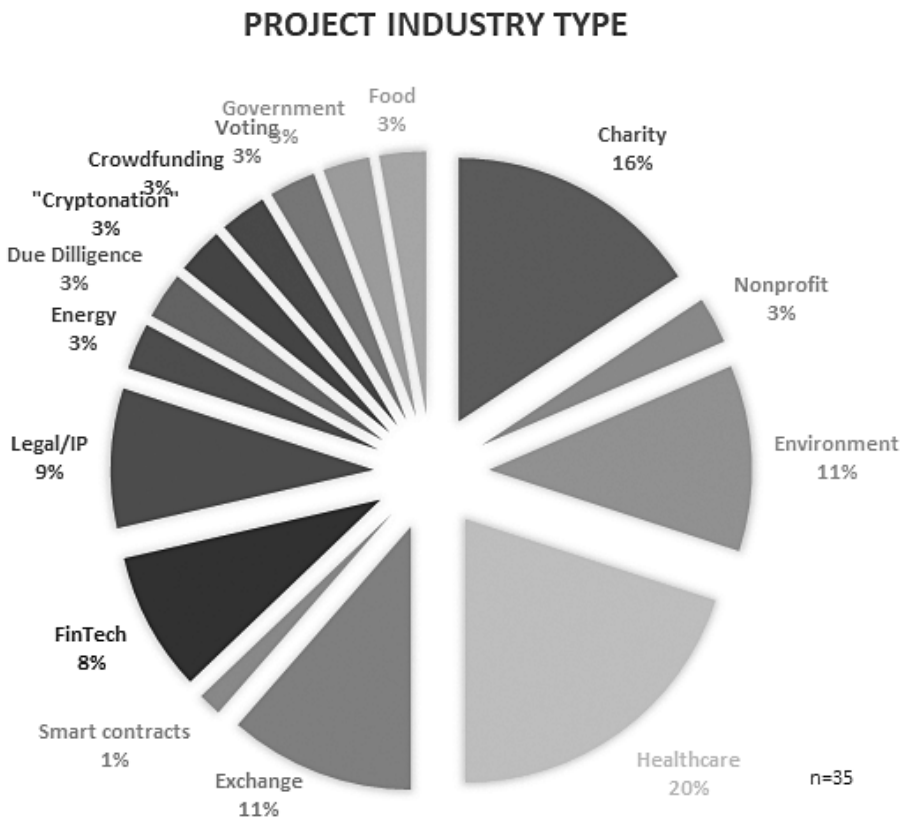


Figure 2: Project by Industry.

Figure 2 shows the breakdown of projects in the dataset by blockchain for good industry. The data suggest that the overwhelming majority of projects in the blockchain for good context are in healthcare, exchanges, environmental protection, as well as charities.

Several industry-wide aggregator events hope to help proliferate blockchain for good initiatives. For example, a collaborative cross-industry Blockchain for Good Hackathon was held in fall 2017 in Dublin. [20] More recently, Maxonrow organized a hackathon that was held in fall 2020 with an eye toward blockchain solutions for COVID-19.[21] In summer 2020, the European Innovation Council (EIC) awarded five million euros to six blockchain initiatives within its "Blockchains for Social Good" program

20. *Accenture and Hyperledger to Host 'Blockchain for Good Hackathon' in Dublin, Inviting Coders to Help Develop Solutions for Digital Identities and Eco-Friendly Supply Chains*, ACCENTURE (Sept. 26, 2017), https://newsroom.accenture.com/news/accenture-and-hyperledger-host-blockchain-for-good-hackathon-in-dublin-inviting-coders-to-help-develop-solutions-for-digital-identities-and-eco-friendly-supply-chains.htm.

21. MAXONROW, hackathon.maxonrow.com (last visited Apr. 9, 2021).

for: WordProof[22] (Netherlands), PPP (Britain), GMeRitS (Finland), Un-Blocked Cash Project OXBBU (Ireland), CKH2020 (France), and PROSUME (Italy).[23] WordProof proves authenticity and makes information verifiable for consumers of news.[24]

*a) Healthcare*

Blockchain technology can play a major role in the transformation of healthcare. The technology allows patients to exercise more control over their personal data in the existing healthcare ecosystem by increasing the security, privacy, and inter-operability of healthcare-related data. [25]

Blockchain technology allows the securing of disparate data sources in healthcare. Using digital signatures on blockchain-based data could allow access to multiple healthcare providers and improve the coordination of patient care significantly. Most people have health records maintained by multiple uncoordinated healthcare organizations including doctors, specialists, and insurance providers. Blockchain technology allows secure shared access to health-related records amongst necessary parties. This can significantly lower fraud in healthcare payments, aid in addressing coverage gaps, and eliminate misinformation provided to healthcare providers.

Examples of blockchain for good projects in the healthcare industry include medical companies that track and distribute inter- and intra-hospital resources via blockchain technology. Some healthcare-oriented projects are for internal use, such as facilitating distributed ledger transactions between teams.[26] Other projects operate on a larger scale, such as to link organ donors to patient matches [27] or a genetic data platform to aid in research and drug development.[28] Supply chain compliance,[29] tracking, and monitoring of food and vaccines[30] can also be accomplished through blockchain. The Centers for Disease Control (CDC) and International Business Machines

22. Jelle van der Schoot, *Dutch Startup WordProof Awarded 1 Million Euros by European Commission*, WORDPROOF (June 30, 2020), https://wordproof.com/dutch-startup-wordproof-awarded-1-million-euros-by-european-commission.

23. Helen Partz, *European Innovation Council Awards $5M to Six Blockchain Projects*, COINTELEGRAPH (July 1, 2020), https://cointelegraph.com/news/european-innovation-council-awards-5m-to-six-blockchain-projects.

24. *WordProof,* NGI (Dec. 20, 2019), https://www.ngi.eu/blockchainsforsocialgood/2019/12/20/wordproof.

25. John D. Halamka et al., *The Potential for Blockchain to Transform Electronic Health Records*, HARV. BUS. REV. (Mar. 3, 2017), https://hbr.org/2017/03/the-potential-for-blockchain-to-transform-electronic-health-records.

26. MEDCOIN, https://www.medxchange.io (last visited Apr. 9, 2021).

27. KIDNER, https://www.kidner-project.com/ (last visited Apr. 9, 2021).

28. GENEYX, https://geneyx.com/ (last visited Apr. 9, 2021).

29. MEDILEDGER, https://www.mediledger.com/ (last visited Apr. 9, 2021).

30. STATWIG, https://statwig.com/ (last visited Apr. 9, 2021).

(IBM) have discussed projects using blockchain to track public health issues and collect electronic health records.[31]

*b) Agriculture*

Blockchain technology can help ascertain the integrity of clean food for consumers. Consumers increasingly favor genetically unmodified organic food from local and sustainable sources. Yet, it is usually difficult to verify the integrity of products. A distributed ledger that takes account of the origin of foods around the world and their production methods could provide the much-needed transparency, especially if integrated into the existing supply chain. The ledger could not only benefit consumers of food to trace the food origin but also can help ensure the fair and sustainable treatment of producers of foods around the globe. The technology could also ensure pricing controls, supply chain integration, and accelerated payment systems.[32]

Some blockchain for good projects claim to use what they label Natural Capital Accounting (NCA). NCA is the process of calculating the total ebbs and flows of natural resources and services in a given ecosystem or region. Using NCA, wealth can be generated by planting more trees, cleaning up the waters, protecting the animals, repopulating the oceans, and reversing climate change. NCA makes the invisible values of nature become visible. The blockchain is perfect for tracking and trading of these values.

The vast majority of farmers in developing countries are considered "smallholder farmers"—farmers with holdings below their region's farm size.[33] Blockchain solutions can ease the process of accessing loans[34] and reduce middlemen.[35] Blockchain could also facilitate a smart transportation system.[36] In conjunction with the United Nations 2030 Sustainable Development Goals,[37] in October 2018, Blockchain Charity Foundation contributed $1 million to the UN Development Programme (UNDP).[38] The United

31. *CDC Health Information Innovation Consortium Overview*, CENTERS FOR DISEASE CONTROL AND PREVENTION, https://www.cdc.gov/ddphss/chiic/index.html (last visited Apr. 9, 2021).

32. Emma Weston & Sarah Nolet, *From Bitcoin to Agriculture: How Can Farmers Benefit from Blockchain?*, AGFUNDERNEWS (Aug. 19, 2016), https://agfundernews.com/from-bitcoin-to-agriculture-how-can-farmers-benefit-from-blockchain6380.html.

33. JEAN-MARC BOUSSARD, *What Is A Smallholder?*, *in* THE IMPACT OF STRUCTURAL ADJUSTMENT ON SMALLHOLDERS (1992).

34. Matthew Quayson et al., *Technology for Social Good Foundations: A Perspective From the Smallholder Farmer In Sustainable Supply Chains*, IEEE TRANSACTIONS ON ENG'G MGMT., 2020, at 2.

35. *Id*. at 3. *See also* GORDON CONWAY ET AL., FOOD FOR ALL IN AFRICA 219–50 (2019).

36. Mirko Zichichi et al., *A Distributed Ledger Based Infrastructure for Smart Transportation System and Social Good*, IEEE 17TH ANN. CONSUMER COMMC'N & NETWORKING CONF., 2020.

37. *The 17 Goals*, U.N. DEP'T ECON. & SOC. AFF. (last visited Apr. 10, 2021), https://sdgs.un.org/goals.

38. *Blockchain Charity Foundation and UNDP Announce Partnership to Explore Blockchain for Social Good*, NEWSRX LLC (Oct. 12, 2018).

Nations implemented a pilot program in order to allocate food and other resources efficiently in refugee camps through the use of tokens in Syria.[39]

*c) Energy*

Blockchain technology has the potential to offer a reliable and low-cost technology solution that enables the supply of clean and sustainable energy to consumers.[40] Sustainable clean energy has become a focus for many consumers around the world. Distributed energy resources are experiencing significant growth. Given the shortcomings of the existing energy infrastructure, governments, utility companies, and other stakeholders require new sustainable and innovative approaches to better regulate and manage the electricity grid. Rooftop solar systems, electric vehicles, and sustainable ride sharing are among the examples of sustainability startups that hope to facilitate a more sustainable energy policy.

*d) Government*

Government entities and quasi-governmental bodies including Non-Governmental Organizations (NGOs) can benefit from considering blockchain technology as a solution to many existing coordination problems. Many government departments work largely without sufficient integration with other governmental bodies. A result of this separation is their inability to share information across agencies. This creates red tape, delay, and negatively impacts the ability to provide effective government services. Linking necessary data between governmental departments via blockchain could eradicate potential government corruption and increase the efficiency of the public sector.

Governments and quasi-governmental bodies have started to embrace blockchain technology to serve social and environmental causes. For instance, the UN already recognized the benefits of blockchain technology. For example, the UN launched an initiative to use the "Ethereum blockchain" network and eye-scanning hardware to distribute coupons to thousands of people in refugee camps in Jordan.[41]

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39. *Blockchain Against Hunger: Harnessing Technology In Support of Syrian Refugees*, WORLD FOOD PROGRAMME (May 30, 2017), https://www.wfp.org/news/blockchain-against-hunger-harnessing-technology-support-syrian-refugees.

40. Jesse Morris, *The Energy Web Foundation: Bringing Blockchain Technology to the Grid*, RENEWABLE ENERGY WORLD, https://www.renewableenergyworld.com/storage/the-energy-web-foundation-bringing-blockchain-technology-to-the-grid (last visited Apr. 10, 2021).

41. Michael del Castillo, *A Branch of the UN Just Launched Its First Large-Scale Ethereum Test*, COINDESK (May 1, 2017, 8:00 AM), https://www.coindesk.com/the-united-nations-just-launched-its-first-large-scale-ethereum-test.

*e) Environmental*

Blockchain for good projects that are in the environmental sector include carbon footprint tracking,[42] incentivizing energy production from renewable resources,[43] facilitating open-source energy,[44] and ethical recycling.[45] For example, Innogy, a German energy company, uses blockchain to allocate solar, wind, and other clean energy across power grids.[46] Ultimately, blockchain regulation of resource use could yield energy decentralization.

The 2001 US Western Energy Crisis[47] and the 2003 Northeast Blackout[48] were a testament to the vulnerabilities of centrally managed energy management. Coordinating larger numbers of decentralized resources from a central point of control is slow, inefficient, and resource-intensive. [49] Blockchain technology can help coordinate these resources and enable a decentralized, resilient, and stable electrical grid,[50] that is also secure. [51] The creation, tracking, and trading of carbon compliance instruments, such as Renewable Energy Certificates,[52] can be facilitated via utility billing systems based on blockchain technology.[53] For example, the UNDP is using blockchain technology to track cashmere herds and limit production from overgrazed areas in order to address soil erosion in Asia. [54] One of the EIC competition winners, PROSUME, allows peer-to-peer energy trading to promote new energy community models that support sustainable energy production, distribution, and storage.[55]

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42. ECOCHAIN, https://ecochain.com; INNOGY, https://www.eon.de/de/innogy.html; DESIGNETZ, https://www.designetz.de; INNOVATION HUB, https://lh-innovationhub.de/en/project/compensaid/; FREE ELECTRONS, https://freeelectrons.org/profile/american-electric-power; GIDX.

43. SOLARCOIN, https://solarcoin.org (last visited Dec. 5, 2021).

44. GRID SINGULARITY, https://gridsingularity.com (last visited Dec. 5, 2021).

45. PLASTIC BANK, https://plasticbank.com (last visited Dec. 5, 2021).

46. INNOGY, https://www.eon.de/de/innogy.html (last visited Dec. 5, 2021).

47. *See, e.g.*, NW. POWER AND CONSERVATION COUNCIL, *Energy Crisis of 2000/2001* (Apr. 10, 2021), https://www.nwcouncil.org/reports/columbia-river-history/energycrisis; FED. ENERGY REGUL. COMM'N, *Addressing the 2000-2001 Western Energy Crisis*, https://www.ferc.gov/industries-data/electric/general-information/addressing-2000-2001-western-energy-crisis (last updated Jun. 8, 2020).

48. *See, e.g.*, Patricia A. Hoffman, *10 Years After the 2003 Northeast Blackout*, U.S. DEP'T OF ENERGY (Aug. 14, 2013), https://www.energy.gov/oe/articles/10-years-after-2003-northeast-blackout; J.R. Minkel, *The 2003 Northeast Blackout—Five Years Later*, SCI. AM. (Aug. 13, 2008), https://www.scientificamerican.com/article/2003-blackout-five-years-later.

49. Claire Henly et al., *Energizing the Future with Blockchain*, 39 ENERGY L.J. 197, 208 n.72 (2018).

50. *Id.* at 208.

51. *Id.* at 214–15.

52. *Id.* at 209.

53. *See id.* at 210–11.

54. Rina Chandran, *Tech Helps Cashmere Herders, Hazelnut Farmers Fight Soil Erosion in Asia*, THOMSON REUTERS (Aug. 4, 2020).

55. *Prosume*, NEXT GENERATION INTERNET (Dec. 20, 2019), ngi.eu/blockchainsforsocialgood/2019/12/20/prosume.

Other examples include the inability of indigenous tribes to make a living without resource extraction from their natural inheritance.

*f) Charitable Donations*

Projects in the charity category facilitate a wide range of tracking and supervisory functions. The transparency blockchain technology offers can help address the public's diminishing trust in traditional charities.[56] Blockchain-based charitable giving solutions[57] allow for charitable donations to be anonymous or named, tracked to their destination, and free of any administrative cost or fee. Projects that utilize tracking and supervisory functions of blockchain technology include donation tracking [58] through the use of a platform-specific token. [59] AidCoin facilitates charitable donations using cryptocurrency, but does not require users to purchase proprietary tokens in order to do so—instead permitting donation in twenty-eight cryptocurrencies.[60] Other projects use blockchain and digital asset technology to facilitate anonymous charitable donations in large quantity, which gave over 5,000 bitcoins to sixty charities[61] (equivalent to about $86 million in December 2017).[62] Directed Cash allows individual donors to specify conditions attached to their donation that are then efficiently paired with interested recipients or charities using distributed consensus to achieve both donation transparency and donor anonymity.[63]

*g) Finance*

Blockchain technology is very advantageous in financial inclusion efforts. These products typically fall under the FinTech4Good category. [64]

56. *See* Muhammad Shoaib Farooq et al., *A Framework to Make Charity Collection Transparent and Audible Using Blockchain Technology*, 83 COMPUT. & ELEC. ENG'G (2020).

57. *See* BINANCE CHARITY, https://www.binance.charity (last visited Dec. 5, 2021); BITGIVE, https://www.bitgivefoundation.org (last visited Dec. 5, 2021); THE PINEAPPLE FUND, http://pineapplefund.org (last visited Dec. 5, 2021); THE SOCIAL TECH TRUST, https://socialtechtrust.org (last visited Dec. 5, 2021).

58. BITGIVE, *supra* note 57; GIVETRACK, https://www.givetrack.org (last visited Dec. 5, 2021).

59. GIFTCOIN, https://www.promisegiving.com (last visited Dec. 5, 2021).

60. AIDCOIN, https://www.aidcoin.com/?lang=EN (last visited Dec. 5, 2021).

61. *See, e.g.*, Michael J. Coren, *A Bitcoin Millionaire's Fortune Will Fund Psychedelic Research, A Cure for Aging, and Clean Water*, QUARTZ (Dec. 20, 2017), https://qz.com/1160997/a-bitcoin-millionaire-is-giving-away-a-fortune-to-psychedelic-research-curing-aging-and-clean-water.

62. THE PINEAPPLE FUND, *supra* note 57.

63. Shweta Jain & Rahul Simha, *Blockchain for the Common Good: A Digital Currency for Citizen Philanthropy and Social Entrepreneurship*, 2018 IEEE International Conference on Internet of Things (iThings) and IEEE Green Computing and Communications (GreenCom) and IEEE Cyber, Physical and Social Computing (CPSCom) and IEEE Smart Data (SmartData), Halifax, NS, Canada, 2018, at 1387–94 (2018).

64. *See, e.g.*, Sharon Burns, *FinTech4Good Market Developing*, NON-PROFIT TIMES (Feb. 21, 2019), https://www.thenonprofittimes.com/technology/fintech4good-market-developing.

Feeless money exchange and transfer capabilities to "the unbanked" can be impactful in regions where fiat currency, banks, and political situations are unstable.[65]

The poor and the unbanked include an estimated two billion people around the world who do not have a savings or checking account in a traditional banking institution and conduct financial transactions outside the mainstream banking system. One in four (28.3 percent), or 34.9 million households out of the total 123.2 million households in the United States, are unbanked. The poor and the unbanked use alternative currencies such as bitcoin, non-bank money orders, check cashing, prepaid debit cards, and payday loans. An example that helps illustrate how the unbanked may benefit from blockchain technology is the Social Tech Trust, which was founded in 2008 and provides investment and support needed for social tech ventures to grow and scale their impact.[66] Alice, a blockchain platform founded in 2016, brings together donors, investors, and nonprofits to deliver transparent social impact, is one project partially funded by the Social Tech Trust.[67] Oradian was founded in 2012 to address growth challenges by creating tools for financial inclusion that are accessible to all financial institutions.[68] Oradian's founders are experts who spent years observing growth obstacles in cooperatives, microfinance institutions, microfinance banks, rural banks, and Savings and Credit Co-Operative Society (SACCOs).

*h) Law*

Blockchain for good projects also cover largely legal considerations. For example, intellectual property ownership can be tracked using blockchain technology. Blockchain-based music and art databases help facilitate direct artist-consumer transactions in order to funnel proceeds directly to artists.[69]

Problems with basic human rights in certain countries can be addressed with blockchain technology. Blockchain can enable tracking of stateless individuals whose basic human rights are challenged in multiple contexts. Bitnation[70] created such a database and provides such individuals documentation of identity for international use, including certificates of

65. ORADIAN, https://oradian.com (last visited Dec. 5, 2021); ALICE, https://alice.si (last visited Dec. 5, 2021); HUMANIQ, https://humaniq.com (last visited Dec. 5, 2021); DISBERSE, https://www.disberse.com (last visited Dec. 5, 2021); STELLAR, https://www.stellar.org/?locale=EN (last visited Dec. 5, 2021).

66. *Impact*, SOCIAL TECH TRUST, https://socialtechtrust.org/impact (last visited Apr. 10, 2020).

67. *Alice: A Case Study*, SOCIAL TECH TRUST (May 2019), https://socialtechtrust.org/our-portfolio/case-studies/alice-a-case-study.

68. ORADIAN, *supra* note 65.

69. *See, e.g.*, RESONATE, https://resonate.is (last visited Dec. 5, 2021).

70. BITNATION, https://tse.bitnation.co (last visited Dec. 5, 2021).

birth and marriage, refugee status, and emergency ID. This scheme calls itself the world's first "Decentralized Borderless Voluntary Nation."

International regulations on trade bring increased due diligence risks. For example, US companies purchasing gold, tin, tantalum, and tungsten are required to disclose whether the purchase funded armed groups in the Democratic Republic of Congo.[71] Supply chain mapping is not only costly and time-intensive, but is not entirely effective.[72] Complete tracking is particularly difficult in the mineral industry because of the prevalence of smelting during processing.[73] Minespider[74] uses blockchain technology to track and verify natural resources by allowing companies at the production stage to create digital blockchain-based certifications based on the amount of material produced.[75]

Land and property management can be ameliorated by blockchain technology. In 2018, 65 percent of the world's land holding fell under traditional tenure systems.[76] In a system like Ghana's, which is bifurcated between modern formal versus traditional informal land governance, transactions are lost, data is inconsistent, and the land market ecosystem has been described as asymmetric.[77] Ben builds upon existing government land registry infrastructure and uses blockchain technology to create a self-sustainable land registry running parallel to the official land registry by facilitating end-to-end housing finance transactions between property developers, commercial lenders, property buyers, and land sector agencies.[78]

Another example of the application of the technology in the legal context includes public access to legal solutions. Traditionally, the cost of legal services often creates an unfair advantage in the law based on wealth. In an effort to address such inequities, some law firms have partnered with blockchain technology firms to create smart contract programs which are designed to facilitate streamlined Alternative Dispute Resolution (ADR) negotiations without the need to interact in person.

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71. *See* Anna Laesser, *Blockchain4Good: How New Startups Around the World Are Pioneering Land Registries, Supply Chains and the Solar Industry*, 1 DELPHI 38, 41 (2018) (discussing Dodd-Frank Act Sec. 1502).

72. *Id.* (discussing supply chain mapping).

73. *Id.*

74. MINESPIDER, https://www.minespider.com (last visited Dec. 5, 2021).

75. Laesser, *supra* note 71, at 42.

76. RIGHTS AND RESOURCES INITIATIVE, *Who Owns the World's Land? A Global Baseline of Formally Recognized Indigenous and Community Land Rights* (Sept. 2015), https://rightsandresources.org/wp-content/uploads/GlobalBaseline_web.pdf.

77. Laesser, *supra* note 71, at 39 (citing Maquli Y. Ahorlumegah, *National Mortgage and Housing Initiative to Provide Gc1bn Housing Fund*, GHANA NEWS ONLINE (Jul. 4, 2018), https://ghananewsonline.com.gh/national -mortgage-and-housing-initiative-to-provide-ghc1bn-housing-fund.

78. Laesser, *supra* note 71, at 39–40.

## IV. Conclusion

This article has demonstrated the potential of blockchain for good projects and their inherent ability to facilitate common good objectives. The long-term benefit of blockchain technology for the common good of humanity depends on decentralized infrastructure development. As more decentralized infrastructure emerges, blockchain for good projects can directly benefit from such infrastructure. Such infrastructure enables blockchain technology to release and fulfill its true potential for humanity.