Distributed degrowth technology: Challenges for blockchain beyond the green economy

Peter Howson

Department of Social Sciences, Northumbria University, Newcastle upon Tyne, UK

Abstract

This commentary considers the challenges and trade-offs in using blockchain as the facilitating digital infrastructure for degrowth projects. A blockchain is simply a distributed database. The technology is being used for a wide range of applications relevant to economic exchange and environmental sustainability. Many degrowth scholars wholly reject technical fixes for politically induced environmental crises, seeing blockchain projects as wasteful and counter to convivial social relations. Others highlight the technology's potential for facilitating redistributive and regenerative economies, but without much detail. This paper argues that if blockchain is ever to prove useful for the degrowth movement it would need to overcome challenges in three important areas: 1) building democratic and (re)distributive economies, 2) regenerating the environment without commodifying it, and 3) facilitating international alliances without imposing a particular set of values. What is certain is that technology on its own will not transcend the political struggles tackled by degrowth activists. However, under certain conditions, blockchain might make those struggles more effective.

Keywords: Blockchain; Degrowth; Technology; Sustainability; Decolonisation; Cryptocurrencies.

1. Introduction

Blockchain technology is providing digital infrastructure for a wide range of applications relevant to environmental sustainability (Howson, 2019). Even so, some critical scholars understand these innovations as over-hyped and driven primarily by 'green economy' logic – the illusion that a system of global perpetual economic growth can be decoupled from environmental decline (Büscher, 2020; Lohmann, 2020). Some scholars conflate the technology with the Bitcoin network and completely reject blockchain projects on the grounds that they are all enormously wasteful (Sullivan, 2018; Lang 2018). Others suggest that blockchain has potential for facilitating redistributive and regenerative post-capitalist economies. Raworth (2017: p192) for example, suggests blockchain is a "game-changing" technology, specifically with regards to facilitating distributed renewable energy microgrids. Büscher and Fletcher, (2020: p180) suggest that, as part of a diverse set of revenue sources, blockchain technologies "can be harnessed in the interest of a broader convivial conservation platform." Kerschner et al. (2018: p1633) argue that blockchain applications "are in urgent need of analysis through the lens of Degrowth […] with respect to both their potential and threats". Blockchain experiments are diverse in function, but all personify their prefigurative politics by design. Each project embodies the politics and power structures that design communities want to enable (Husain et al, 2020). This commentary aims to start a critical discussion around blockchain projects whose prefigurative embodiments are determined by a degrowth agenda.

Degrowth is an umbrella term for many diverse theories and activist perspectives atheistic towards economic growth as the primary measure of human flourishing, and critical of a-political environmentalism. From a degrowth perspective, growth is a hegemonic ideology that obscures more ecologically friendly and egalitarian alternatives (Kallis, 2018). The goal of degrowth is neither to prevent increases in GDP, nor is it the equivalent to recession in a growth

economy. GDP may decline as an outcome of degrowth policies, but if/when it does, this would take place in socially and environmentally sustainable ways (Demaria et al., 2019). The oppositional activism of degrowth is concerned with building alternatives to growth (Demaria et al., 2013). 'Convivial conservation' (Büscher and Fletcher, 2020), 'frugal abundance' (Latouche, 2009), 'ecofeminist sufficiency' (Salleh, 2017) and 'prosperity without growth' (Jackson, 2017) are concepts used by many degrowth scholars and activists to describe what these alternative futures might look like (Demaria et al, 2019). Some of these proponents are explicitly sympathetic towards alternatives to growth-orientated futures, but reject the degrowth label for being technophobic, overly negative, and uninspiring (Drews and Antal, 2016; Raworth, 2017). This commentary does not frame degrowth, environmental justice, buen vivir, community economies, re-commoning and other related concepts, as oppositional to each other. The point is not to pick the right label, but rather to create broadly popular political strategies from all of them for tackling environmental crises (Barca, 2017). Such strategies will inevitably require 'simple living' practices and 'low-tech' ideas (Bihouix, 2020). But this commentary considers the challenges and trade-offs in constructing convincing decentralised / distributed technologies that might catalyse interest away from the cliff edge, towards a sustainable degrowth society. The following section offers a short introduction to blockchain for the uninitiated and reviews important degrowth critiques of technological innovation more broadly. The paper then critically discusses some of the challenges of using the technology to facilitate a degrowth transition to sustainability, in three important areas: 1) equitable (re)distribution of resources, 2) ecological regeneration, and 3) decolonisation. The paper concludes recommending further research and development of carefully considered applications.

2. Degrowth and blockchain

Much of the recent degrowth literature repeats critiques of technology articulated by earlier thinkers, such as Gorz (1980), Ellul (1989), and Marcuse (1964), adapting it to contemporary challenges (Muraca and Neuber, 2018). Degrowth thinkers such as Charbonneau (1980) situated the broad degrowth movement in the dialectics of Nature and human freedom, understanding that growth-motivated technological change destroys both. Echoes of this position resonate through more recent critiques of green innovation; as a primary destroyer of Earth's biodiversity and stable climate (Robbins, 2020), and surveillance capitalism; a primary destroyer of human freedom (Zuboff, 2019). Green growth thinking, far from decoupling material consumption with economic growth, has been shown to increase consumption, a phenomenon neatly graphed in the Jevons paradox[1] (Giampietro and Mayumi, 2018). Surveillance capitalism, far from making our lives easier, intrudes on the most private human experiences that take place within intimate digital worlds that surround individuals and organisations. Technology monitors and tracks users' thoughts and movements both online, as well as in physical space, via networks of smart phones and Internet of Things (IoT) devices. The harvested 'behavioural data' is then used in the development of 'prediction products', which in turn are used to limit the freedoms of users in the interests of the platform (Zuboff, 2019). This juncture marks an inevitable 'counterproductivity threshold' – systems of digital technology so complex, have failed to serve their original purpose. Instead of freeing ourselves, our tools have enslaved us (Illich, 1973). To enable a 'wise technological future' (Pansera et al., 2019), where digital infrastructures marry up with degrowth aspirations, technologies must

[1] The Jevons Paradox suggests that an increase in efficiency in resource use generates an increase in long-term resource consumption rather than a decrease. Increasing energy efficiency is akin to increasing the productivity of energy. This gives an effect of reducing energy's implicit price, increasing the rate of return and demand.

support ecologically sustainable, redistributive local economies, whilst countering domination and social disconnection under digital systems of surveillance capitalism.

Although a clear tension exists between the more primitivist and the techno-optimist views in degrowth debates (Robbins, 2020), there are multiple useful case-studies exploring proclaimed 'degrowth technology' in action (Kerschner et al, 2018). These include communal bike kitchens (Bradley, 2018), composting toilets, small scale wind turbines and micropyrolizers (Vetter, 2018). These 'appropriate technologies' (see Schumacher, 1974) are important for a degrowth society, but they are rarely understood as central catalysing technologies of degrowth. A toilet does not enable conviviality – "individual freedom realised in personal interdependence" (Illich, 1973, 24). Decentralised and distributed technologies, like blockchain, can facilitate and scale-up community economies, enabling individuals and groups to relate to each other globally without restrictions imposed through dominant surveillance platforms (Pazaitis et al, 2017).

Manski and Bauwens (2020) suggest that a peer-to-peer (P2P) trajectory – a commoning process through which people share digital resources outside of market relations and co-produce technologies – is essential for enabling transitions out of capitalism. Through such a trajectory, market-orientated modes of exchange become less suited for new digital technologies, compared to open, commons-based forms of production (Kostakis and Bauwens, 2014; Kallis et al., 2018). Growth-orientated incarnations of P2P, through Uberised 'sharing' platforms for example, are often even more energy intensive and alienating than traditional modes of capital accumulation (Garcia-Ayllon, 2018). But blockchain could enable a more sustainable P2P trajectory, whilst potentially helping the degrowth movement navigate the current impasse between socialist ecomodernism and anarcho-primitivist ideas (Robbins, 2020).

A blockchain is a distributed database. Unlike a shared spreadsheet, hosted for example, by Google or Microsoft and arranged in numbered columns and rows, a blockchain is arranged as time-stamped blocks strung together in a cryptographically secured chain. The database is 'distributed' – hosted by all users – enabling immutable recording of transactions on a network. The database is very difficult to hack, with no single point of authority to make mistakes and collapse the system. The cryptocurrency network, Bitcoin, was the first blockchain application, but cryptocurrencies are just one use for the technology. Despite using the same P2P approach, many blockchain platforms bear little resemblance to currencies. Some blockchains, like Ethereum, use algorithms to facilitate automated 'smart contracts' and Distributed Autonomous Organisations (DAOs). These secure mechanisms for electronic collaboration use self-executing code to eliminate the need for trusted intermediaries brokering between transacting parties. (see Fig. 1).

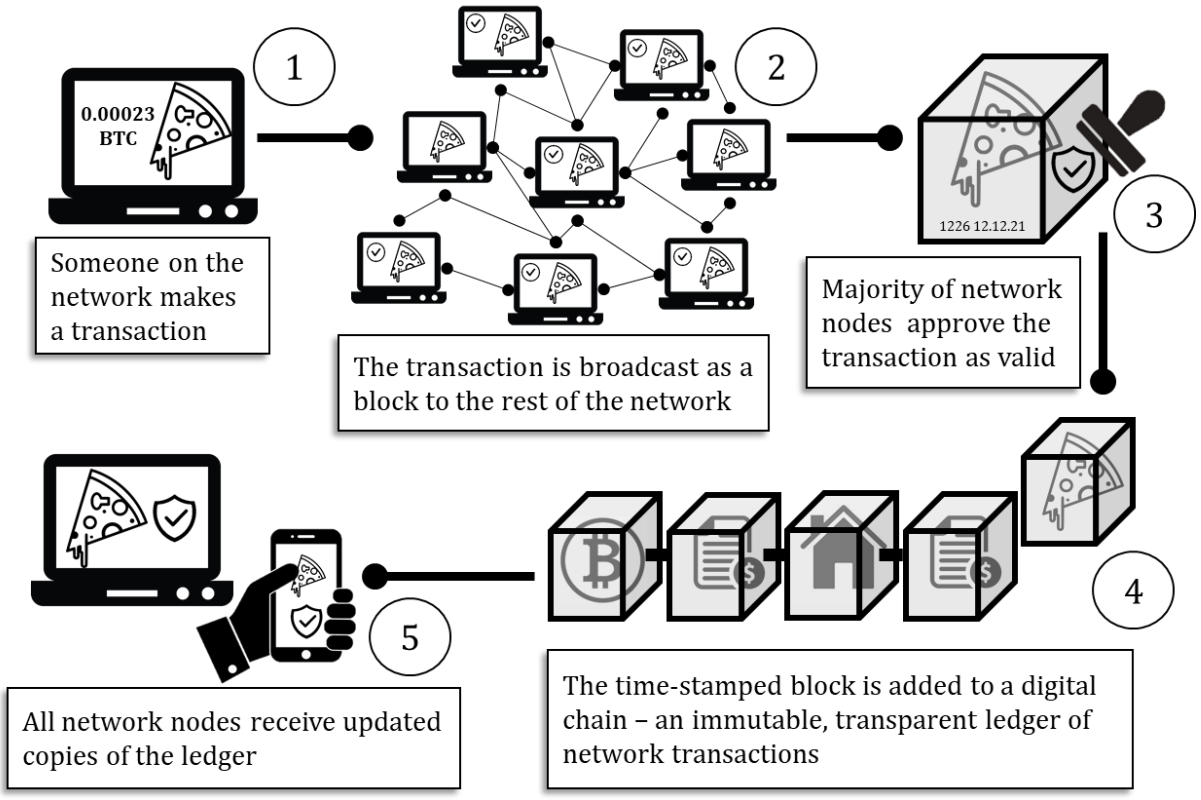

Fig. 1. Typical mechanics of a blockchain transaction.

Blockchain platforms have been developed to enable, for example, decentralised renewable energy grids and climate change mitigation platforms (Howson, 2019), alternative food production networks and environmental monitoring (Howson et al, 2019), land registries and supply chain management systems (Goldstein and Newell, 2020), charitable giving platforms (Howson, 2020d), and humanitarian assistance (Howson, 2020a). Despite the dominant uses for the technology sitting firmly within the green economy master narrative, blockchain could also provide opportunities for facilitating degrowth objectives (Balaguer Rasillo, 2020). The technology is enabling effective ecological regeneration in some instances, while also steering paths towards socially equitable and decolonised outcomes. But the benefits of blockchain are not universal, alternative non-blockchain approaches often exist, while applications always come with challenges and trade-offs.

3. Blockchain for democratic and (re)distributive economies

Some blockchain projects aim for institutional reforms that fit with degrowth aspirations to disrupt debt-based economic systems, whilst inspiring alternative community currencies. Blockchain projects are also being used to help envision direct alternatives to representative democracy, universal basic income (UBI) schemes, and protection of the material and digital commons (see Table 1).

Project	**Description / use case**	**Development stage**
Alice in Government	A blockchain tool for users to vote transparently on collective strategies to tackle climate change.	Active
Circles	A blockchain-based universal basic income tool to support local community economies.	Active
Democracy.Earth	Ethereum-based platform issues tokens to verified participants, providing a means of governance through staking and proxy delegation. The VOTE token allows network participants to validate candidate identities by staking whilst preventing ‘bots’ and ‘sybils’.	Active

Duniter	Software providing the ability to create cryptocurrencies and deploy them as Universal Basic Income (UBI) schemes.	Active
Economic Space Agency	A blockchain-based value creation system, featuring a distributed exchange and a peer-to-peer issuance of rights, money, credit, stake holding and sharing of surplus as distinct protocols.	In development
FairCoin	A cryptocurrency for communities. Independent groups can buy Faircoin from centralised nodes, then decide autonomously how to reach common goals whilst participating in open assemblies to make proposals for developments and changes.	Active
Mastodon	Open-source and decentralised platform for facilitating closed (permissioned) social networks.	Active
The People's Bank of Govanhill	A feminist community currency project in Govanhill, Glasgow. The project takes existing community economies as a starting point, mapping the local economy, expanding ideas of community currency and looking at how feminist economics can be put into practice in the local community.	Active
Redecentralize	An independent, volunteer-driven organisation connecting blockchain developers with media, policymakers and the wider public to promote the decentralisation of digital technology.	Active
Regen.Network	A blockchain platform that simultaneously serves as a 'true cost accounting machine', an 'ecological data marketplace', a 'distributed computational network', and a 'biospheric monitoring device'.	In development
Rohingya Project	A self-sovereign ID platform that does not rely on states or third-party intermediary to issue supporting documents for accessing credit and other services.	In development
Scuttlebutt	A decentralised secure 'gossip platform'. Messages are passed directly between friends via an open p2p 'gossip protocol' without dependence on a single central server.	Active
HYPHA/SEEDS	A blockchain platform for incentivising participation in tasks required to create a healthier society. Users earn Seeds for planting trees and doing good deeds.	Active
Terra0	Artist collective exploring creative uses for blockchain-based Decentralised Autonomous Organisations (DAOs) on the Ethereum network for ecosystem protection.	In development

Table 1: Examples of blockchain applications for social good[2]

[2] Contents based on a review of project white papers, consisting of a broad desk-based inspection of blockchain-based platforms and tokenised projects engaged in sustainability and civic engagement. The active/dormant

The People's Bank of Govanhill[3] started as a series of community currency experiments, ad-hoc exchanges, on-the-street discussions, and workshops mapping intersecting local economies. The Glasgow project uses open blockchain experiments for exploring ways of putting ecofeminist economics into practice. In the spirit of Gibson-Graham et al.'s (2013) 'Economy as an Iceberg' metaphor, the project aims to encode a new local economy with degrowth principles to support the diverse informal, uncommodified, and reciprocal care practices subordinated in a growth-orientated market economy. Unlike The People's Bank of Govanhill, the decentralised and open-source cryptocurrency, FairCoin, aims to grow beyond a single localised community. The FairCoin experiment is designed to support local degrowth economies that are organisationally autonomous but affiliated to a wider global network (Balaguer Rasillo, 2020). FairCoin was established by the FairCoop movement, in the footsteps of the Catalan Integral Cooperative (CIC) in Catalonia. Despite their explicit degrowth intentions, according to Dallyn and Frenzel (2020) FairCoin's design is problematic due to the omission of effective 'commons boundaries' (Ostrom, 1990), or 'filtering layers' (De Angelis 2017). They argue that post-capitalist commons need clear boundaries to remain protected from encroaching values and practices of capital. In the case of FairCoin, these encroachments centre around state backed fiat currency, hierarchical market libertarian influences (Bitcoin, for example), and projects of private value extraction from the commons. Filtering layers between these entities are required inevitably because some capital is necessary to sustain the commons, and to enable the wider movement to expand and scale up without diluting the group's radical communal anarchist ideals and practices (Dallyn and Frenzel, 2020).

Blockchain technology is also being used to facilitate new forms of local democratic governance. Democracy.Earth have developed a censorship-resistant, open-source platform for

status of each was checked against exchange databases or remote interviews took place with project developers where a project's status could not be confirmed online.

[3] https://www.creativescotland.com/explore/read/stories/features/2019/crypto-knitting-circles

enabling ‘quadratic voting’ within networks. Quadratic voting is a method for collective decision-making that makes the marginal cost proportional to votes cast (Siddarth et al, 2020). Participants are equally allocated a token budget with which to spend on voting. Vote tokens cannot be bought and sold, but the more someone votes on a single issue, the more costly it becomes, eliminating the necessity for polarisation in binary decision making. As with any voting system, there is a potential for tokens to be used as currency. Preventing coercion and undue influence in voting systems is impossible using software alone.

Just as groups can agree and deploy blockchain applications to oversee communal decision-making processes, groups can also agree rules governing monetary exchange. Linares and Cabaña (2020) argue that programmable systems of *demurrage* (or ‘rotting money’), to make money reduce in value when not in use, to make it better as a medium of exchange, can help solve economic, social and ecological crises when embedded within a degrowth framework. They propose multiple money forms to nurture people’s social reproduction. One active example is Circles, which uses the Ethereum xDAI sidechain[4] to produce a UBI system distributing a fixed monthly income to any verified community members. The platform has been trialled in Bali, Indonesia with reports suggesting that an alternative community cryptocurrency improves both wealth equality, and access to basic needs in poor communities (Brown, 2021).

Despite their radical potential, Fouksman and Klein, (2019) argue that without scrutiny, these UBI schemes are a Trojan Horse. They create oppressive class formations and are a colonising force where specific racial groups are targeted for experimentation. Platforms like these, built by well-meaning blockchain developers, might also evolve into a more broadly oppressive rule-

[4] A sidechain is a designation for a blockchain ledger that runs in parallel to a primary blockchain. In the case of xDAI, the main advantage to such a configuration is the low execution cost relative to standard smart contract transactions, as interaction with the main Ethereum blockchain, which attracts high ‘gas fees’, is minimal.

based system, or ‘blockocracy’ as Kavanagh and Ennis (2020) describe it. These would of course not be degrowth applications. But, for degrowth to graduate from an activist slogan and social movement (Demaria, et al. 2013) to economic institutionalisation beyond the local scale, it is likely that communication technology will need to hold it all together. Decentralised/distributed P2P applications that are non-hierarchical in governance structure could be required (Pazaitis et al, 2017; Balaguer Rasillo, 2020).

4. Ecological regeneration beyond crypto-carbon spectacle

A key sticking point for many critical scholars concerning blockchain is the technology’s capacity to disintermediate otherwise secure livelihoods (Kshetri, 2017). Blockchain applications are also often resource intensive, both in terms of hardware use (Lange et al., 2020) and energy requirements, relative to the human labour they displace (Klein, 2018; Sullivan, 2018). As de Vries (2019) suggests, given the fundamental challenges in uniting Bitcoin mining with renewable energy, as well as the perpetual turnover of mining hardware, we should conclude that renewable energy could never enable a sustainable Bitcoin. But not all blockchain consensus protocols are as energy intensive as Bitcoin’s. For example, ‘Proof of Stake’ (PoS) protocols require less than 1% of the energy consumption needed for ‘Proof of Work’ (PoW), as used by Bitcoin, Monero and Dash among others. ‘Delegated proof of stake’ (DPoS) and the ‘delegated Byzantine fault tolerance’ (DBFT) models use negligible amounts of energy to grant validating power to stake-holding nodes (Howson, 2019). The 2020 Serenity (or ETH2) update to Ethereum completely removes the need for miners, and associated perpetual hardware updates, to maintain the network.

Blockchain technology using alternative validation models can facilitate fast, scalable, and energy-efficient applications. But greener blockchains do not automatically equate with

degrowth. Many blockchain projects are merely using environmental credentials to enable new forms of 'green grabbing' for global carbon market mechanisms (Howson et al., 2019). Infinite Earth's Veridium Labs project for example, is a Hong Kong-based private company working in partnership with IBM and Stellar, to develop a platform for selling carbon off-sets from the Rimba Raya reserve in Indonesia using cryptocurrency. The sale of these 'cryptocarbon' tokens repays the projects' private investors, rather than local host communities. The project is a profit-orientated venture that does not directly incentivise additional tree planting activities, or carbon storage (Howson, 2020a). Growth-orientated incentive solutions also risk maintaining pre-existing North-South neo-colonial geographies of inequality. Plastic Bank, for example is a tokenised rewards scheme incentivising informal waste plastic collection by poor communities via a blockchain app and smart-phone wallet. The app provides a creative and cost-effective way for Plastic Bank's corporate partners in the Global North (including Henkel, SC Johnson, and Eat Natural) to disingenuously engage the issues of plastic pollution in the Global South, without having to find alternatives to plastics (Howson, 2020b). Other growth-orientated companies such as Adaptation Ledger, Climate Trade and Climate Futures have launched blockchain platforms for facilitating the sale of green bonds. For example, The Green Assets Wallet has been developed to help scale the global market for green debt products, primarily from Africa. The platform functions as a tool for bond validation and impact reporting (Green Assets Wallet, 2019). Blockchain technology is also being leveraged to mitigate pollution, and enable more transparent food supply chains (Howson, 2020b). These improved efficiency and consumer confidence interventions are not geared towards reducing upstream material throughput or tackling over-consumption of resources, but rather to enable new markets and capital accumulation.

Gunderson et al. (2019) describe an 'energy boomerang effect', where mechanisms to increase resource efficiency and decarbonise energy production result in increased energy use and

unsustainable material consumption across the wider economy. This is not an issue with renewable energy production *per se*, but with the imperative to utilise energy for capital accumulation and economic growth. A degrowth development model, they argue, with collectively owned energy systems allow for a reduction in total energy use. Blockchain is being used to enable such community-owned and operated distributed microgrids and P2P energy exchange, where individuals transact energy among themselves without the need for central oversight from profit-seeking intermediaries (Gardner, 2019). However, there are inevitable implementation challenges. Blockchain solutions that combine energy efficiency, scalability, speed, and security characteristics cannot yet be achieved without significant trade-offs. Andoni et al. (2019) argue that in many cases blockchain-based micro-grids have few advantages relative to conventional databases that are currently faster and less resource-intensive. Blockchain systems may require the production of new hardware infrastructure, the costs of which need to be outweighed by benefits achieved by data integrity, enhanced security, and elimination of the need for trusted intermediaries.

Blockchain-based applications, like Terra0's, appear clearly as transitioning tools for degrowth. Terra0 is an artistic intervention attempting to conserve terrestrial ecosystems allowing them to own and protect themselves. The blockchain project uses distributed land registries that do not differentiate between individual, corporate, or even non-human entities as specified owners of land (Gloerich et al., 2018). For Terra0, the agency of forests is understood in terms of a set of relations that produce a desired outcome, enabling a forest to shape an economy (Howson, et al., 2019). Terra0 creates a framework whereby a forest can sell licenses to remove forest resources through smart contract DAOs. With the accumulated capital, the forest (represented by the DAO) buys itself from the project initiators, eventually owning itself. The 'augmented-forest' is then able to finance itself, buy more land and expand, whilst promoting sustainable stewardship opportunities for human caretakers (Seidler et al, 2016).

Terra0's applications remain untested, but these are one of many aspirational degrowth projects proposing creative blockchain solutions towards real-world challenges for sustainability[5].

To expand degrowth livelihood opportunities for humans, Büscher and Fletcher (2020) envision a Conservation Basic Income (CBI). These schemes, they propose, would enable a basic income grant for sustainable land stewards and should replace failing market-based instruments, like Payments for Ecosystem Services (PES) and REDD+. Although Büscher and Fletcher argue for traditional centralised institutions, like NGOs, states and the private sector, to take the lead and fund these schemes, distributed blockchain applications, like Circles and Democracy.Earth, are already enabling similar community managed basic income tools. Basic income schemes like this are more democratic, scalable, and transparent compared to centralised approaches. Subverting traditional power brokers of conservation finance might also enable decolonisation, or just replace these brokers with something worse (Howson, 2020c).

5. Scaling-up degrowth without crypto-colonialism

Solutions to growth-induced environmental crises rooted in positivism, reinforce a colonial perspective (Nirmal and Rocheleau, 2019). Favouring a pluralism of values, a growing coalition of degrowth scholar-activists are aiming to transform degrowth into a scaled-up international field, bridging networks of social and environmental justice movements (Liegey and Nelson, 2020). To avoid a colonial approach to the bridging process, a primary concern must be to avoid one branch of ideas being imposed on vulnerable groups, especially technological ideas, like blockchain. Escobar (2018: 65) argues that to positively design tools

[5] Terra0 is part of the Sovereign Nature Initiative (https://sovereignnature.com/). The group aims to reconfigure the intersection between ecology, economy, and emerging technologies "to open our minds to radical approaches toward sustainability".

for degrowth requires the deconstruction of the colonial divide – "the us-versus-them divide that was introduced with the conquest of America, slavery, and colonialism and is alive and well today with modernizing globalization and development". For degrowth technology to be decolonising, it should not exhibit a propensity for deployment towards neo-colonial projects, and it must be useful for reparative justice. If distributed technologies limit freedoms of vulnerable groups and leave intact the legacies of colonial dispossession, whether they were 'co-produced' or not, then their design is not decolonising.

Howson (2020a) explores how environmental crises are used to justify 'crypto-colonialism', where blockchain technology is used to extract economic benefits from peoples suffering scars of colonialism in the Global South. These benefits include land, labour, data and other resources needed to facilitate capital interests elsewhere. One of the starkest manifestations of this blockchain-based neo-colonialism is observed in the exclusive crypto-enclaves of Puerto Rico. As Crandall (2019) explains, degrowth visions from Puerto Rico's women-led and grassroots groups, to exercise collective sovereignty over their land, energy and resources, conflicts with the growth-oriented visions conjured up by crypto-enthusiasts (primarily men in fintech and venture capital from the United States) looking to establish their own crypto-utopia. Blockchain applications can connect diverse groups, but often involve attaching automated conditions to interactions, inevitably leading to power asymmetries, whilst limiting the freedom of some users (Howson, 2020d). The Indonesia-based blockchain project, SEEDS[6], aims to provide fledgling communities, often relocating from the Global North, with tools for constructing local economies, including UBI schemes, whilst incentivising community-based ecologically regenerative tasks, like tree planting. As well as being potentially colonising,

[6] https://www.joinseeds.com/

SEEDS maintains a hierarchical multi-level structure and an associated governance framework which is likely to promote homogeneity, rather than diversity of interests.

In some cases, blockchain initiatives are being used to promote indigenous customary land claims. But indigenous, does not always equate with degrowth. Some initiatives like the Honduran blockchain land registry, designed with indigenous communities in mind, has been criticised for leaning heavily towards the growth-orientated business interests of their developers (Eder, 2019). The Canadian non-profit organisation, Blockchain for Reconciliation, aims to ensure blockchain project promotions account for local interests and are sympathetic to local struggles for reparative justice and reconciliation from colonialism. The project advocates on behalf of Treaty Four Cree and Saulteaux First Nation communities. The blockchain-agnostic group[7] asserts that there is no better place for 'trustless' systems than between indigenous peoples and the Canadian government. The group describe themselves as 'a filter layer' encouraging distributed application developers to start working with indigenous communities in a spirit of collaboration, not colonisation. Other indigenous blockchain projects, such as IDGO aims to create tourism and blockchain-based community economies for local indigenous peoples. Indigenous ID cards are verified by indigenous community nodes globally to strengthen local autonomy and ethnic identity. Tourists can buy digital passport permits, the revenue from which is returned to indigenous communities to pay for environmental protection, education, and cultural continuity (Ringuette, 2018). These projects may help empower some communities in the short term. They may encourage meaningfully engaged visitation. But such projects also support the conventional growth economy if they entertain alienated workers looking for eco-touristic voyeurism (Higgins-Desbiolles et al., 2019). In localised degrowth economies, the need for such escapism is less likely (Howson, 2020c), but the need for building international alliances between marginalised communities

[7] https://blockchainforreconciliation.ca/

will remain. Dislocated communities, including indigenous perspectives, will continue to benefit from cultural exchange, even within a sustainable degrowth society.

Despite these mixed results, critical degrowth scholars should not be too keen to wholly reject blockchain. This technology foments political and economic change by circumventing growth-orientated interests, rather than fighting them (Russo, 2020). Continuing this fight maintains a crisis of imagination, blinkering the degrowth movement from seeing alternative post-capitalist futures (Thwaites, 2020). A distributed network of global infrastructure supporting more direct, deliberative, and democratic forms of governance, owned by a network of networked communities, could help transcend that crisis.

6. Conclusions

Centralised digital technology is destroying human freedoms and the environment (Bihouix, 2020). With new blockchain platforms for surveillance capitalism, green growth tools for environmental management are becoming increasingly more automated (Howson et al, 2019). Despite these concerns, some scholars understand blockchain as a potentially useful tool for transitioning towards a post-capitalist society (Huckle and White, 2016; Raworth, 2017; Büscher and Fletcher, 2020). Others argue that explorations around distributed technology point to a red herring, diverting attention away from degrowth's target adversaries (patriarchy, racism, environmental destruction, and class conflict). This commentary has offered a critical exploration of blockchain solutions to start discussions concerning how (or if) these technologies could be useful in facilitating sustainable degrowth economies. The exploration has focused on three key challenges for the technology. If blockchain is ever to prove useful for degrowth it would need to: 1) help build (re)distributive economies, 2) regenerate the environment without commodifying it, and 3) help facilitate international alliances without

imposing a particular set of values. There are many other litmus tests besides those explored here that require research. What is certain is that these technologies on their own will not transcend political struggles ‘away from keyboard’. They might, however, make those struggles more effective, enabling a transition away from market capitalism locally and/or at scale.

For sustainable degrowth, trust must be built before a blockchain. The technology potentially opens doors to new possibilities by transcending neoliberal crises of imagination (Thwaites, 2020). But degrowth scholars must be mindful that blockchain projects exist because their users often do not trust their institutions or even each other (Golumbia, 2016). Using ‘trustless’ systems to enable the exchange of things between users who are indifferent towards building strong trusting communities will ultimately lead to unsustainable and socially divisive outcomes. The goal of degrowth projects, therefore, should not be to use blockchain for degrowth, but to be open to technologies like blockchain if a transition to degrowth requires them.

Green growth, inclusive growth, sustainable growth: these would all be coherent approaches for trusted global leaders to manage an accelerating economy. However, the global economy has hit a wall. The slowdown, according to Dorling (2020), is not a temporary blip on the way to sunnier uplands, as humanity continues apace with ‘the great acceleration’. In the approaching aftermath of COVID-19 lockdowns globally, and a broad distrust of white-supremacist patriarchal state leadership, the need for ‘recovery’ (growth) appears questionable. Despite the challenges and trade-offs described here, this is an ideal time for more degrowth research and, perhaps, for designing and deploying blockchain projects to enable a sustainable degrowth society.

References

Andoni, M., Robu, V., Flynn, D., Abram, S., Geach, D., Jenkins, D., McCallum, P. and Peacock, A., 2019. Blockchain technology in the energy sector: A systematic review of challenges and opportunities. Renewable and Sustainable Energy Reviews, 100, pp.143-174.

Balaguer Rasillo, X., 2020. Alternative economies, digital innovation and commoning in grassroots organisations: Analysing degrowth currencies in the Spanish region of Catalonia. Environmental Policy and Governance,. e1910

Barca, S., 2017. In defense of degrowth. Opinions and minifestos/Doughnut economics. Seven ways to think like a 21st century economist. Local Environment, 23(3): 378-381.

Bradley, K. 2018. Bike Kitchens – Spaces for convivial tools. Journal of Cleaner Production, 197: 1676-1683.

Bihouix, P., 2020. The Age of Low Tech. Bristol University Press.

Brown, S. 2021. Universal Basic Income for Bali Research Report. [online] Polis. Available at: <https://blog.polis.global/universal-basic-income-for-bali-research-report/> [Accessed 3 June 2020].

Büscher, B. 2020. The Truth about Nature: Environmentalism in the Era of Post-Truth Politics and Platform Capitalism, University of California Press

Büscher, B. and Fletcher, R. 2020. The conservation revolution. London: Verso

Charbonneau, B., 1980. Le Feu Vert. Lyon: Parangon

Crandall, J., 2019. Blockchains and the "Chains of Empire": Contextualizing Blockchain, Cryptocurrency, and Neoliberalism in Puerto Rico. Design and Culture, 11(3): 279-300.

Dallyn, S. and Frenzel, F. 2020. The Challenge of Building a Scalable Postcapitalist Commons: The Limits of FairCoin as a Commons-Based Cryptocurrency. Antipode, Early View.

De Angelis, M. 2017. Omnia Sunt Communia: On the Commons and the Transformation to PostCapitalism. London: Zed

Demaria, F., Schneider, F., Sekulova, F. and Martinez-Alier, J., 2013. What is Degrowth? From an Activist Slogan to a Social Movement. Environmental Values, 22(2): 191-215.

Demaria, F., Kallis, G. and Bakker, K., 2019. Geographies of degrowth: Nowtopias, resurgences and the decolonization of imaginaries and places. Environment and Planning E: Nature and Space, 2(3): 431-450.

Dorling, D. 2020. Slowdown. London: Yale University Press

Drews, S. and Antal, M., 2016. Degrowth: A "missile word" that backfires?. Ecological Economics, 126: 182-187.

Eder, G. 2019. Digital Transformation: Blockchain And Land Titles. [online] Oecd.org. Available at: <https://www.oecd.org/corruption/integrity-forum/academic-papers/Georg%20Eder-%20Blockchain%20-%20Ghana_verified.pdf> [Accessed 3 June 2020].

Ellul, J. 1989. The search for ethics in a technicist society. in F. Ferré, C. Mitcham (Eds.), Research in Philosophy & Technology, vol. 9, JAI Press, Inc., London and Greenwich

Escobar, A (2018) Designs for the Pluriverse. Duke University Press

Fletcher, R. and Büscher, B., 2020. Conservation basic income: A non-market mechanism to support convivial conservation. Biological Conservation, 244: 108520.

Fouksman, E. and Klein, E. 2019. Radical transformation or technological intervention? Two paths for universal basic income. World Development, 122, pp.492-500.

Garcia-Ayllon, S., 2018. Urban Transformations as an Indicator of Unsustainability in the P2P Mass Tourism Phenomenon: The Airbnb Case in Spain through Three Case Studies. Sustainability, 10(8), 2933.

Gardner, J. 2019. Peer-to-Peer Energy Trading and Blockchain: The Future of Distributed Energy Resources. Natural Resources & Environment, 33 (4): 8-11.

Giampietro, M. and Mayumi, K., 2018. Unraveling the Complexity of the Jevons Paradox: The Link Between Innovation, Efficiency, and Sustainability. Frontiers in Energy Research, 6:26

Gibson-Graham, J., Cameron, J. and Healy, S., 2013. Take back the economy: An Ethical Guide for Transforming Our Communities. University of Minnesota Press: Minneapolis

Golumbia, D., 2016. The Politics of Bitcoin: Software as Right-Wing Extremism. University of Minnesota Press: Minneapolis

Goldstein, B. and Newell, J., 2020. How to track corporations across space and time. Ecological Economics, 169: 106492.

Green Assets Wallet (2019). Africa Guide for Investors. [online] Green Assets Wallet. Available online at: https://greenassetswallet.org/africa-guide-investors [accessed April 7, 2020].

Gorz, A. 1980. Ecology as Politics. Boston: South End Press

Gunderson, R., Stuart, D., Petersen, B. and Yun, S., 2018. Social conditions to better realize the environmental gains of alternative energy: Degrowth and collective ownership. Futures, 99, pp.36-44.

Higgins-Desbiolles, F., Carnicelli, S. Krolikowski, C. Wijesinghe, G. and Boluk K. (2019) Degrowing tourism: rethinking tourism J. Sustain. Tourism, 27 (12): 1926-1944

Hirsch, E. 2017. The unit of resilience: unbeckoned degrowth and the politics of (post)development in Peru and the Maldives. Eur. J. Polit. Econ., 24 (1): 462-475.

Howson, P. 2019. Tackling climate change with blockchain. Nature Climate Change, 9(9): 644-645.

Howson, P., Oakes, S., Baynham-Herd, Z. and Swords, J. 2019. Cryptocarbon: The promises and pitfalls of forest protection on a blockchain. Geoforum, 100: 1-9.

Howson, P. 2020(a). Climate Crises and Crypto-Colonialism: Conjuring Value on the Blockchain Frontiers of the Global South. Frontiers in Blockchain, 3: 1-6.

Howson, P. 2020(b). Building trust and equity in marine conservation and fisheries supply chain management with blockchain. Marine Policy, 115: 103873.

Howson, P. 2020(c). Degrowth and the Blue Belt: Rethinking marine conservation in the British Overseas Territories. Ocean & Coastal Management, 196, 105290.

Howson, P. 2020(d). Crypto-giving and surveillance philanthropy: Exploring the trade-offs in blockchain innovation for nonprofits. Nonprofit management and leadership. Early View. https://doi.org/10.1002/nml.21452

Huckle, S. and White, M., 2016. Socialism and the Blockchain. Future Internet, 8(4), p.49.

Husain, S.O., Franklin, A. and Roep, D. (2020) The political imaginaries of blockchain projects: discerning the expressions of an emerging ecosystem. Sustain Sci. 15, 379–394

Jackson, T., 2017. Prosperity Without Growth. London: Routledge.

Illich, I., 1973. Tools for Conviviality. London: Calder and Boyars.

Kallis, G. Demaria, F. and D'Alisa, G. (2015) Introduction: degrowth, in D'Alisa, G. Demaria, F. Kallis, G. (Eds.), A Vocabulary for a New Era, London: Routledge

Kallis, G., Kostakis, V., Lange, S., Muraca, B., Paulson, S. and Schmelzer, M., 2018. Research on Degrowth. Annual Review of Environment and Resources, 43(1): 291-316.

Kavanagh, D. and Ennis, P., 2020. Cryptocurrencies and the emergence of blockocracy. The Information Society, 36(5), 290-300.

Kallis, G., 2018. In Defense Of Degrowth. Uneven Earth Press

Kerschner, C., Wächter, P., Nierling, L. and Ehlers, M. 2018. Degrowth and Technology: Towards feasible, viable, appropriate and convivial imaginaries. Journal of Cleaner Production, 197: 1619-1636.

Klein, N. 2018. Puerto Ricans And Ultrarich “Puertopians” Are Locked In A Pitched Struggle Over How To Remake The Island. [online] The Intercept. Available at: <https://theintercept.com/2018/03/20/puerto-rico-hurricane-maria-recovery/> [Accessed 3 June 2020].

Kostakis, V. and Bauwens, M., 2014. Network Society and Future Scenarios for a Collaborative Economy. Houndmills, Basingstoke, Hampshire: Palgrave Macmillan.

Lally, N., Kay, K. and Thatcher, J., 2019. Computational parasites and hydropower: A political ecology of Bitcoin mining on the Columbia River. Environment and Planning E: Nature and Space, p.251484861986760.

Lalley, S. and Weyl, G., 2016. Quadratic Voting. [online] Available at: <https://economics.rice.edu/sites/g/files/bxs876/f/Weyl%20(paper)%20-%20Feb%202017.pdf> [Accessed 3 June 2020].

Lang, C., 2018. The Kariba REDD project in Zimbabwe: From carbon credits to EARTH tokens. [online] REDD-monitor.org. Available at: http://www.redd-monitor.org/2018/02/08/the-kariba-redd-project-in-zimbabwe-from-carbon-credits-to-earth-tokens/ [Accessed 3 June 2020].

Lange, S., Pohl, J. and Santarius, T., 2020. Digitalization and energy consumption. Does ICT reduce energy demand? Ecological Economics, 176, 106760.

Latouche, S. 2009. Farewell to Growth. Cambridge: Polity.

Liegey, V., and Nelson, A. 2020. Exploring Degrowth: A Critical Guide. London: Pluto Press

Linares, J. and Cabaña, G., 2020. Degrowth Money. [online] Degrowth.info. Available at: <https://www.degrowth.info/en/2020/05/degrowth-money/> [Accessed 2 March 2021].

Lohmann, L. 2020. Blockchain Machines, Earth Beings and the Labour of Trust. The Corner House

Manski, S. and Bauwens, M. 2020. Reimagining New Socio-Technical Economics Through the Application of Distributed Ledger Technologies. Frontiers in Blockchain, 2. 29: 1-17

Marcuse, H., 1964. One-Dimensional Man. Boston: Beacon Press.

Muraca, B. and Neuber, F., 2018. Viable and convivial technologies: Considerations on Climate Engineering from a degrowth perspective. Journal of Cleaner Production, 197: 1810-1822.

Nirmal, P. and Rocheleau, D., 2019. Decolonizing degrowth in the post-development convergence: Questions, experiences, and proposals from two Indigenous territories. Environment and Planning E: Nature and Space, 2(3): 465-492.

O'Neil, C. 2016. Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy. New York: Random House.

Ostrom E (1990) Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge: Cambridge University Press

Pansera, M., Ehlers, M. and Kerschner, C., 2019. Unlocking wise digital techno-futures: Contributions from the Degrowth community. Futures, 114, 102474.

Pazaitis, A., De Filippi, P. and Kostakis, V. 2017. Blockchain & value systems in the sharing economy: The illustrative case of Backfeed. Technological Forecasting and Social Change, 125: 105-115.

Raworth, K., 2017. Doughnut Economics. Vermont: Chelsea Green

Ringuette, M., 2020. Why Blockchain is The Holy Grail of Indigenous Communities. [online] Medium. Available at: <https://medium.com/idgo/why-the-blockchain-is-the-holy-grail-of-indigenous-communities-aa48893c3e97> [Accessed 30 November 2020].

Robbins, P., 2020. Is less more … or is more less? Scaling the political ecologies of the future. Political Geography, 76, 102018.

Rommel, J., Radtke, J., von Jorck, G., Mey, F., Yildiz, Ö., 2018. Community renewable energy at a crossroads: a think piece on degrowth, technology, and the democratization of the German energy system. J. Clean. Prod. 197, 1746-1753

Salleh, A., 2017. Ecofeminism as Politics. Nature, Marx and the Postmodern. London: Zed Books.

Schneider, N. 2015. On The Lam With Bank Robber Enric Duran. [online] Vice. Available at: <https://www.vice.com/en_us/article/wd7edm/be-the-bank-you-want-to-see-in-the-world-0000626-v22n4> [Accessed 3 June 2020]

Seidler, P., Kolling, P. and Hampshire, M. 2016. Terra0: Can An Augmented Forest Own And Utilise Itself? [online] Available at: <https://www.terra0.org/assets/pdf/terra0_white_paper_2016.pdf> [Accessed 14 January 2021].

Siddarth, D., Ivliev, S., Siri, S. and Berman, P. 2020. Who watches the watchmen? Review of subjective approaches for sybil-resistance in Proof of Personhood protocols. Frontiers in Blockchain, 3:590171.

Sullivan, S., 2018. Nature 3.0 – Will blockchain technology and cryptocurrencies save the planet? [online] Available at: https://entitleblog.org/2018/02/01/nature-3-0-will-blockchain-technology-and-cryptocurrencies-save-the-planet/ [Accessed 8 Nov 2018].

Thwaites, D., 2020. A DAO of One's Own? Feminist Strategies for P2P Organisations - P2P Models. [online] P2P Models. Available at: <https://p2pmodels.eu/feminist-strategies-for-p2p-organisations/> [Accessed 30 November 2020].

Vetter, A., 2018. The Matrix of Convivial Technology – Assessing technologies for degrowth. Journal of Cleaner Production, 197: 1778-1786.

Zuboff, S., 2019. The Age of Surveillance Capitalism. London: Profile Books.