

Intro

Over the past century, the general public has been aware of Earth's fragility, but have not taken enough action to prevent further damage due to exponential growth in population and consumerism. The rise of population comes with growing consumerism, and this continuous growth leads to a problem of use of economic and social resources. The problem of these resources constantly mass produced and disposed without proper ethics and regulations.¹ In the last decade however, both government and private organizations have pooled resources into promoting environmental awareness, and taking actions in pursuing sustainability. Along with government and private sectors, technology has improved exponentially, and is playing a major role in environmental sustainability. Blockchain technology plays into environmental sustainability based on database, and validity of the work so whoever is on the network can keep track of it. Blockchain practices in supply chain, recycling, renewable energy each contain their own implications on environmental sustainability.

Understanding Blockchain Through Bitcoin

To understand blockchain technology role in environmental sustainability, individuals must understand how it works. Bitcoin is a frequent example for this discussion because it is the first cryptocurrency utilizing blockchain technology. Bitcoin's nature is decentralized and transparent, mean anyone on the network can see the transactions; the transaction information is recorded into a block, and linked to the blockchain. Users on the network have a copy of the blockchain, and it will update periodically with the transaction information. Because of the

¹ Jackson, Tim, and Peter Senker. "Prosperity without growth: Economics for a finite planet." *Energy & Environment* 22, no. 7 (2011): 1013-1016.

nature of Bitcoins and blockchain, it is nearly impossible to hack into and alter any data; once the information is on the chain, it is there forever.² Relating back to environmental sustainability, blockchain is not limited to cryptocurrency and can be tailored to specific needs.

Why It Matters

Leveraging blockchain in environmental sustainability brings about positive implications because it forces information and actions to be more transparent, and can be verified by people on the network. Before blockchain technology, individuals had to rely on centralized system uphold the responsibility and is not transparent. An organization would promote their environmental agenda with promises, people give money to the organization, but do not know fully how their investment is distributed.³ With blockchain technology, this is not the case because individuals are granted the ability to join a blockchain platform, can partake in pushing the projects in the network, their records will be transparent and be corruption-proof, individuals will uphold their share of responsibility, and forego the middleman method that was in centralized systems.⁴

Supply Chain

² Nakamoto, Satoshi. "Bitcoin: A peer-to-peer electronic cash system." (2008): 28.

³ Wright, Aaron, and Primavera De Filippi. "Decentralized blockchain technology and the rise of lex cryptographia." (2015).

⁴ Christidis, Konstantinos, and Michael Devetsikiotis. "Blockchains and smart contracts for the internet of things." *IEEE Access* 4 (2016): 2292-2303.

Blockchain has been finding itself increasingly used on the business fronts, but has been underused on the production end. Today, food production is a massive industry, with millions of people to feed, companies must increase production to keep up with demand. This logic is doubled for produce manufacturers, which try to keep fresh fruits and vegetables available to consumers all year round. In recent years, people have been giving more thought towards the food they consume on a daily basis. Before, they used to only concern themselves with the amount of calories, fats, and sugars were in the foods so as to provide proper nutritional values. Next was what the food itself was made of, with full lists of all chemicals, ingredients, and preservatives inside the food. Currently, the next push of information to be given to consumers is the location of where the food is created, shipped from, and delivered to. The problem with such a big industry is how much fraud can possibly take place, with certain companies cutting corners to get their stock out quickly and cheaply.

Blockchain can help remedy this situation, by allowing a means to track the way products are shipped to stores, minimizing fraud. There are companies which exist to do just this: two examples are FoodTrax and Provenance.⁵ FoodTrax provides an Ethereum-based means of tracking where food is created and shipped. Consumers can access the data at any time, for any step of the production process, from where the animal came from to how and where it was converted into the food product we bought in the store. The company was created after the horse-meat scandal a few years ago, which caused a great schism between companies and consumers. It works like a spider web, with the consumer purchasing a “token” to be placed in a

⁵ "7 Ways The Blockchain Can Save the Environment and Stop Climate Change." September 8, 2017. Accessed November 20, 2017. <http://futurethinkers.org/blockchain-environment-climate-change/>.

digital “wallet” which sends and receives blockchain data from the retailers and manufacturers selling the product.⁶ Provenance works in the same way, with both businesses and consumers signing up for the service. Businesses have firm control over the amount of transparency they wish to give their consumers to raise trust with them (Provenance).⁷ These two models appear to be a step in the right direction after consumers were becoming aggravated and concerned over what they were eating and where it was coming from. The use of blockchain to bring transparency back into the food production process gives the power back to the consumer and places them on the same level as the corporations they are placing their health in.

Energy

Energy Efficiency Coin (EECoin) is a blockchain system developed by EnLedger Technology to have a positive ecological impact. Through EECoin, the public will be able to participate in an energy-efficient blockchain network, provide funds to renewable energy projects, increase competition for renewable energy assets, and drive production up on renewable energy forms. EECoin runs on EnergyChain; a custom blockchain utilizing Proof-of-Stake, messaging protocol for token transactions, smart-contracts, and voting. EECoin are minted by the company so new valueless coins, or “bloats” cannot be forged. EECoin can be tracked, and be traded within users in the system. If individuals invest in EECoin, they know that they are contributing to clean and renewable energy projects, and making a positive environmental

⁶ Welcome to FoodTrax. Accessed November 27, 2017. <https://www.bcdc.online/foodtrax>.

⁷ Provenance for Business. Accessed November 29, 2017. <https://www.provenance.org/about>.

impact.⁸ Another blockchain application oriented towards sustainable energy is SolarCoin: a blockchain system developed by DeKo, An Electricity-Backed Currency Proposal to harness energy from the Sun and give solar energy value. DeKo's plan enables households and solar facilities to be energy sources, companies or individuals can purchase generated energy with the SolarCoin, and that cryptocurrency can be converted for other forms of payment.⁹

EECoin and SolarCoin have a positive impact because these blockchain technologies push the population towards sustainable energy practices. This is however, barely the beginning because blockchain will be the answer to updating and improving current energy distribution system. Instead of people relying on centralized sources such as power plants, blockchain has the potential to make peer-to-peer energy trading a reality; this method is believed to be more efficient, and reliable because it is constantly being updated. In addition to peer-to-peer energy exchange, cities can now utilize a "smart grid" management system that can diagnose network emergencies and problems, and solve those issues; this approach is still under development, and may be available to the public in the near foreseeable future.¹⁰

Recycling

Although organizations have been working on recycling solutions, individuals play an integral role in solution's success. This is where Ethereum, a platform which allows the public to

⁸ Dispenza, J., Garcia, C., & Molecke, R. (2017). Energy Efficiency Coin (EECoin) A Blockchain Asset Class Pegged to Renewable Energy Markets.

⁹ Johnson, Luke Patrick, Ahmed Isam, Nick Gogerty, and Joseph Zitoli. "Connecting the Blockchain to the Sun to Save the Planet." (2015).

¹⁰ Basden, James, and Michael Cottrell. "How Utilities Are Using Blockchain to Modernize the Grid." *Harvard Business Review* (2017).

build decentralized applications, comes in. Using Ethereum, BCDC, Blockchain Development Company united to develop business solutions and develop a range of socially and environmentally impacting products and services (BCDC). We present two examples: one focusing at the micro level and other to is on the macro level. Decentralized apps in operating in recycling, RecycletoCoin, which is from BCDC. While Plastic Bank is its own company, also using blockchain.¹¹

RecycletoCoin aims to create motives that the individual participate for recycling. RecycletoCoin partners with global charities and aims at reducing plastic bottles and aluminum cans from the bottom up. In doing so, people are rewarded with digital currency called BCDC tokens through automated machines. Later, these digital tokens are exchanged with bitcoins, gift cards, and money via Paypal. With tracking from the blockchain aspect to promotes safety and allows accurate records. In discussing the impacts and implementations of RecycletoCoin, will help reduce plastic waste, by promoting recycling. RecycletoCoin gives a positive reinforcement to recycling by the use of a reward system and also transparent for both sides. They also give an alternative route for recycling and it is also very flexible.

Plastic Bank uses blockchain, but also reduces poverty in developing countries. Plastic Bank does this by monetizing plastic waste through other companies buying this recycled plastic waste, this practice was called Social Plastic. To discuss the impacts of Social Plastic strengthens the motivation for recycling plastic waste in developing countries for the opportunity to have a better living conditions, also decreasing plastic waste. Specifically, securing and

¹¹ "RecycletoCoin." Blockchain Development Company. Accessed December 14, 2017.

<https://www.bcdc.online/recycletocoin>.

allowing transparency in digital transactions; digital tokens will be managed and earned safely. An example of Social Plastic would be Haiti, by trading plastic waste they could gain services, goods, and cash. Through, these rewards people could make and buy 3D printers leading to water filters or phone cases.¹² From the macro level with Social Plastic, third world countries and communities have the opportunities.

Carbon Tax

One of the biggest problems we face in trying to sustain the environment, is the amount of natural resources we are pulling from the Earth to produce everyday consumables. Today the average consumer is aware of what goes into what they're buying, but is under-informed as to how much of an impact their purchase has on the environment. Blockchain technology is one possible way of tracking how much of an impact our purchases make, and promote better buying in the future. Blockchain can record, chronologically and publicly, purchases made with some sort of cryptocurrency, which has the potential to be a perfect candidate for digital currency as it requires multiple approval steps and has no impact on the environment physically.¹³

For the average consumer, a carbon tax would traditionally mean a price hike at the pump. However, it also affects how much one would have pay to heat their home. “Under the current carbon plan, in 2018, there will be a tax of \$1.51 a gigajoule of natural gas.” (Johnson) Next to heating, the foods purchased and consumed in homes are the second largest producers of carbon emissions; meat, cheese and eggs have the highest carbon footprint while fruits,

¹² The Future of Recycling: Social Plastic for a Social Cause." B the Change. January 04, 2017. Accessed December 06, 2017. <https://bthechange.com/the-future-of-recycling-social-plastic-for-a-social-cause-f1906e11776c>.

¹³ “This New Carbon Currency Could Make Us More Climate Friendly.” Lisa Walker. September, 19, 2017

vegetables, beans and nuts have much lower carbon footprints.¹⁴ Tracking the carbon footprint of each product using the blockchain would protect this data from tampering, and it can be used to determine the amount of carbon tax to be charged on at the point of sale. If a product with a large carbon footprint is more expensive to buy, this would encourage buyers to buy products which are more environmentally friendly, and therefore encourage companies to restructure their supply chains to meet the demand for such products.¹⁵ China-based firm and IBM have already taken a step in this direction by using blockchain to build a prototype marketplace for carbon assets. In building this prototype, they are trying to encourage companies to take steps to reduce their emissions by making it more efficient to develop and manage carbon assets.¹⁶ China's dedication to reducing their carbon emissions through blockchain creates a large global impact, as China produces roughly one fourth of the world's carbon emissions.

Conclusion

Blockchain has enabled collaborative and transparent platforms in pursuit of environmental sustainability, and invites people who want to be involved. This is definitely a huge step forward in pursuit of environmental sustainability because of its accessibility, transparency, and decentralized nature. Blockchain technology has already proved limitless applications, and

¹⁴ "Food's Carbon Footprint" Green Eatz. <http://www.greeneatz.com/>

¹⁵ "7 Ways The Blockchain Can Save the Environment and Stop Climate Change." September 8, 2017. Accessed November 20, 2017. <http://futurethinkers.org/blockchain-environment-climate-change/>.

¹⁶ "IBM China Wants to Use Blockchain to Fight Carbon Emission." Stan Higgins. November, 17, 2016. <https://www.coindesk.com/ibm-china-blockchain-climate/>

environmental sustainability is one of them. In addition, any individual or organizations with technical prowess and insights can build their own platform in reaching sustainability goals.