

Investing in a Sustainable Future: How Fintech and Blockchain Enable Green Asset Investments for Financial Security

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Abstract: The world is moving fast towards clean energy, and investors recognize the significance of investing in clean energy because of the prospects of such investment. Investing in clean energy projects such as solar farms and wind turbines is receiving tremendous attention across the globe. The continuous development of technology tools in finance, most importantly fintech and blockchain, supports the exploration of investments in clean energy. Therefore, investment in clean energy is adding to the fight against fossil fuels, which reduces the impact of climate change across the globe. The paper investigated, using desk research, how fintech and blockchain are transforming investment in green energy to combat climate change impact across the globe. The paper revealed the impact of blockchain technology on green investment and how investors benefit from their investments in green energy. The paper will ignite investors' curiosity to explore the benefits of fossil fuel control and further push fossil fuel control advocates to invest in green energy projects.

Keywords: investment in green energy, fintech, blockchain technology, climate change, renewable energy projects

1. Introduction

Imagine a world where you can invest in clean energy projects like solar farms or wind turbines while securing your financial future. This dream is becoming a reality thanks to the innovative use of fintech (financial technology) and blockchain technology. These tools are transforming how we can support sustainable projects, making it easier and more profitable to invest in green assets. In this article, we will explore how fintech and blockchain are making green investments accessible to everyone, helping individuals achieve their financial goals while contributing to a healthier planet. As the world faces increasing environmental challenges, from climate change to resource depletion, the need for sustainable investments has never been more critical. Traditional investment avenues often fall short in addressing these urgent issues, primarily because they do not directly support environmentally friendly projects. However, the advent of fintech and blockchain technologies is changing the landscape of investment, offering new and exciting ways for individuals to support green initiatives while also seeking financial security.

Fintech, which encompasses a wide range of digital financial services, has revolutionized how we handle money. It includes everything from mobile banking and online lending to digital wallets and crowdfunding platforms. These innovations make financial services more accessible, efficient, and user-friendly. One of the most promising aspects of fintech is its ability to democratize investment opportunities, allowing more

people to participate in funding projects that align with their values, such as renewable energy and sustainable agriculture [1].

Blockchain technology, on the other hand, provides a secure and transparent way to manage investments. Blockchain is essentially a digital ledger that records transactions across multiple computers so that the record cannot be altered retroactively without altering all subsequent blocks. This ensures that the data is secure and trustworthy. Blockchain's transparency and security features make it an ideal platform for managing investments in green assets, ensuring that funds are used as intended and that investors can track the impact of their contributions [2, 3].

The combination of fintech and blockchain is particularly powerful in the realm of green investments. Fintech platforms can simplify the process of investing in green projects, making it as easy as shopping online. Blockchain technology can ensure that these investments are secure, transparent, and efficient. For instance, blockchain can be used to tokenize green assets, allowing for fractional ownership. This means that even small investors can own a part of a large solar farm or wind turbine, thereby democratizing access to sustainable investments [4]. Moreover, these technologies are not just for technologically proficient individuals or large institutional investors. They are designed to be accessible to everyone, from seasoned investors to those new to the concept of sustainable investing. This accessibility is crucial for mobilizing the large amounts of capital needed to address global environmental challenges. By making it easier for individuals to invest in green projects, fintech and blockchain technologies are playing a vital role in driving the transition to a more sustainable economy [5].

In this article, we will research into how fintech and blockchain are transforming the landscape of green investments. We will explore specific examples of how these technologies are being used to support renewable energy projects, discuss the benefits and risks associated with these investments, and highlight the potential for fintech and blockchain to make a significant impact on our efforts to create a sustainable future. By the end of this article, you will have a clearer understanding of how you can participate in this exciting new frontier of sustainable investing, helping to build a greener planet while securing your financial future.

2. The Growing Need for Sustainable Investments

2.1. Understanding Green Assets

Green assets are investments in projects and companies that focus on environmental sustainability. These investments are designed to generate positive environmental outcomes while also providing financial returns. Examples of green assets include investments in clean energy sources, such as solar and wind power, and sustainable agriculture. By directing capital towards these projects, investors can help reduce carbon footprints and promote a healthier environment. This dual focus is central to the concept of green investments, which aim to address environmental challenges such as climate change, resource depletion, and pollution.

2.2. Clean Energy Investments

Investing in clean energy, such as solar and wind power, is a prime example of green assets. These renewable energy sources are essential for transitioning away from fossil fuels, which are major contributors to climate change. Solar panels and wind turbines generate electricity without emitting greenhouse gases, making them crucial for reducing our carbon footprint [6]. Investments in these technologies not only help combat climate change but also offer financial returns through the sale of electricity and government incentives [7].

Solar energy harnesses the power of the sun to generate electricity through photovoltaic cells or solar thermal systems. Photovoltaic cells convert sunlight directly into electricity, while solar thermal systems use mirrors or lenses to concentrate sunlight to produce heat, which can then be used to generate electricity [8]. The cost of solar panels has decreased significantly over the past decade, making solar power more accessible and economically viable for both residential and commercial use [9]. Governments around the world offer various incentives, such as tax credits and subsidies, to promote the adoption of solar energy [10]. Additionally, advancements in energy storage technologies are enhancing the efficiency and reliability of solar power systems, enabling them to provide a stable energy supply even when the sun is not shining [11].

Wind energy is another pivotal clean energy source, utilizing wind turbines to convert the kinetic energy of wind into electricity. Wind power is particularly advantageous in regions with strong, consistent wind patterns. Offshore wind farms, located in bodies of water, take advantage of higher wind speeds and have the potential to generate significant amounts of electricity [12]. Onshore wind farms, while generally smaller, are more widespread and easier to install. The development of larger and more efficient wind turbines has increased the capacity and output of wind farms [13]. Similar to solar energy, wind energy benefits from government incentives and policies aimed at reducing greenhouse gas emissions and promoting renewable energy sources.

2.3. Sustainable Agriculture

Sustainable agriculture practices aim to produce food in ways that are environmentally friendly, socially responsible, and economically viable. This includes methods such as organic farming, agroforestry, and regenerative agriculture. Investments in sustainable agriculture can lead to healthier soils, increased biodiversity, and reduced use of synthetic pesticides and fertilizers, which can have harmful environmental impacts [14]. These practices not only help preserve natural resources but can also increase yields and profitability for farmers, making them attractive investment opportunities.

Organic farming is a method of agriculture that relies on natural processes and inputs to cultivate crops and raise livestock. This practice avoids the use of synthetic pesticides, fertilizers, Genetically Modified Organisms (GMOs), and growth hormones. Instead, organic farmers use crop rotations, compost, green manure, and biological pest control to maintain soil fertility and manage pests and diseases. Organic farming promotes soil health, reduces water pollution, and enhances biodiversity on the farm [15]. Moreover, organic products often command premium prices in the market, providing higher income potential for farmers [16].

Agroforestry integrates trees and shrubs into agricultural landscapes, creating a diverse ecosystem that supports crop production, livestock rearing, and forest conservation. This practice offers multiple benefits, including improved soil structure, enhanced water retention, and increased biodiversity. Trees provide shade and shelter for crops and animals, reduce soil erosion, and sequester carbon dioxide, contributing to climate change mitigation [17]. Agroforestry systems can also produce a variety of products such as fruits, nuts, timber, and medicinal plants, diversifying farmers' income streams and increasing resilience to market fluctuations and environmental changes.

Regenerative agriculture focuses on restoring and enhancing the health and vitality of farm ecosystems. This approach involves practices such as cover cropping, reduced tillage, rotational grazing, and the use of compost and animal manures. These techniques aim to rebuild soil organic matter, improve soil biodiversity, and increase water infiltration and retention [18]. Regenerative agriculture can lead to more resilient farming systems that are better able to withstand droughts, floods, and other extreme weather events. Additionally, by sequestering carbon in the soil, regenerative agriculture helps combat climate change and enhances the long-term sustainability of agricultural production [19].

3. How Fintech is Revolutionizing Green Investments

3.1. Green Investment Platforms

Imagine you want to invest in a solar farm but don't know where to start. Fintech companies have developed online platforms that make this easy. These platforms allow you to browse various green projects, see their details, and invest with just a few clicks. It's like shopping online but for investments in sustainable projects.

Green investment platforms leverage the power of financial technology (fintech) to provide accessible and user-friendly interfaces for investors. These platforms simplify the investment process by offering detailed information about various green projects, including their environmental impact, financial returns, and associated risks. Investors can compare projects, track their performance, and make informed decisions without the need for extensive financial expertise or intermediaries [20]. The convenience of online platforms allows investors to manage their portfolios from anywhere, making green investments more accessible to a broader audience.

One of the key advantages of green investment platforms is the transparency they offer. These platforms provide comprehensive data and analytics about each project, including its sustainability metrics, progress reports, and financial performance. This transparency helps build trust between investors and project developers, ensuring that funds are used as intended and that projects deliver on their environmental and financial promises [21]. Additionally, many platforms incorporate blockchain technology to enhance the traceability and security of transactions, further increasing accountability and investor confidence.

Green investment platforms offer a diverse range of investment opportunities across various sectors, including renewable energy, sustainable agriculture, and eco-friendly technologies. Investors can choose from projects that align with their values and investment goals, whether they are interested in supporting community solar initiatives, investing in wind farms, or funding sustainable farming practices [22]. This diversity allows investors to build a well-rounded portfolio that not only seeks financial returns but also contributes to positive environmental and social outcomes.

Traditionally, investing in large-scale green projects like solar farms or wind turbines required significant capital and industry knowledge. Green investment platforms have lowered these barriers by enabling fractional investments, allowing individuals to invest smaller amounts of money in large projects. This democratization of green investments means that even small investors can participate in and benefit from the growing green economy. Crowdfunding models and peer-to-peer lending options available on these platforms further enhance the accessibility of green investments [23].

3.2. Crowdfunding for Green Projects

Crowdfunding is another powerful tool enabled by fintech. It's similar to a community fundraiser but on a much larger scale. People from all over the world can contribute small amounts of money to fund significant green projects. Platforms like Kickstarter have popularized this model, but now it's being used to finance everything from renewable energy projects to sustainable agriculture. Crowdfunding platforms connect project developers with potential investors, allowing them to raise capital from a large pool of contributors. This method democratizes the investment process, making it possible for individuals to support initiatives that align with their values without needing substantial capital. For instance, renewable energy projects such as community solar farms or wind turbines can be funded through small contributions from many individuals, thus spreading the financial risk and making green investments more accessible [24].

Sustainable agriculture projects also benefit from crowdfunding. Farmers and agricultural entrepreneurs can raise funds to implement eco-friendly practices such as organic farming, agroforestry, and regenerative

agriculture. This not only helps them transition to more sustainable methods but also engages the community in supporting local and environmentally responsible food production [25]. Furthermore, crowdfunding for green projects often includes transparency features, allowing contributors to track the progress and impact of their investments. This accountability fosters trust and encourages more people to participate in sustainable funding initiatives [26].

4. Blockchain Technology and Green Investments

4.1. Tokenization of Green Assets

Blockchain technology facilitates the tokenization of green assets, a process akin to slicing a large pizza into many small, manageable pieces. Each piece, or token, represents a share of the whole asset. This means that green assets such as solar farms and wind turbines can be divided into digital tokens, allowing investors to own fractions of these assets. Tokenization democratizes investment opportunities by lowering the financial barriers to entry. Even those who cannot afford to buy an entire wind turbine can still invest in part of it and earn returns proportionate to their investment. This approach can also increase liquidity in the market, as tokens can be easily traded on various blockchain-based exchanges. By enabling fractional ownership, tokenization opens up green investments to a broader audience, including retail investors who previously had limited access to such opportunities [27].

4.2. Smart Contracts

Smart contracts, a key feature of blockchain technology, function as self-executing digital agreements. These contracts automatically enforce the terms of an investment without the need for intermediaries. For instance, if an individual invests in a wind farm, a smart contract can automatically distribute profits based on the farm's performance metrics [28]. This automation not only reduces administrative costs but also minimizes the risk of fraud, enhancing the security and efficiency of the investment process. Moreover, smart contracts can handle complex agreements and automate various compliance checks, ensuring that all regulatory requirements are met without manual intervention [29]. By streamlining processes and reducing reliance on third parties, smart contracts increase the overall transparency and trustworthiness of green investments [30].

4.3. Transparency and Trust

Blockchain technology operates as a transparent, immutable ledger where every transaction is recorded and cannot be altered. This transparency is akin to a public diary where every financial transaction is visible to all but cannot be changed by anyone [31]. Such a transparent system builds trust among investors, as they can track the flow of their funds and verify that their investments are being used appropriately. Additionally, the immutability of the blockchain ensures that historical data cannot be tampered with, providing a reliable audit trail for all transactions. This level of transparency is particularly valuable in green investments, where stakeholders demand accountability and assurance that their funds are contributing to genuine sustainability efforts [32].

5. Benefits for Investors

5.1. Stable and Predictable Returns

Green investments, especially in renewable energy, often offer stable and predictable returns. Investing in renewable energy projects can be likened to planting a tree that steadily grows and provides fruit year after

year. Renewable energy projects typically operate under long-term contracts, such as Power Purchase Agreements (PPAs), which guarantee a steady income stream over a span of 20–25 years [33]. These agreements provide fixed prices for the energy produced, insulating investors from market volatility and ensuring consistent returns. Studies have shown that renewable energy projects tend to have lower operational and maintenance costs compared to conventional energy sources, further enhancing their financial stability [34]. Moreover, the increasing global focus on sustainable development and climate change mitigation is likely to continue driving policy support and financial incentives for renewable energy investments, further stabilizing returns [35].

5.2. Protection Against Inflation

Inflation acts like a sneaky thief that slowly erodes the value of money over time. Many green investments, particularly in the energy sector, offer protection against inflation through mechanisms such as inflation-linked utility rates [36]. For instance, utility companies often adjust their rates for renewable energy projects in line with inflation, ensuring that the value of the investment remains intact. This means that the income generated from these investments adjusts upward with inflation, preserving the purchasing power of the returns and safeguarding investors from the detrimental effects of inflation. Additionally, green bonds, which are specifically designed to fund environmentally friendly projects, often include terms that adjust for inflation, providing another layer of financial security for investors [37].

5.3. Positive Social and Environmental Impact

Investing in green assets goes beyond financial returns; it is also about creating a positive impact on the world. By channeling funds into projects that promote sustainability, investors contribute to combating climate change and preserving natural resources for future generations [38]. For instance, investments in renewable energy reduce dependence on fossil fuels, decrease greenhouse gas emissions, and promote cleaner air and water. This dual benefit of financial returns and environmental impact is often referred to as “double bottom line” investing [39]. Additionally, green investments support job creation in emerging sectors like renewable energy, sustainable agriculture, and green technology, fostering economic growth and social well-being. Beyond environmental benefits, these investments can enhance social equity by providing access to clean energy in underserved communities and supporting local economies through sustainable development projects [40].

6. Real-World Examples of Blockchain-Enabled Green Investments

6.1. SolarCoin

SolarCoin is a digital currency designed to reward solar energy producers for generating clean energy. For every Megawatt-hour (MWh) of solar energy produced, the producer earns one SolarCoin [41]. This incentive structure encourages the adoption and production of solar energy by providing a tangible financial reward. Investors can purchase SolarCoins, thereby supporting solar energy production and benefiting from the potential appreciation of the currency as the demand for renewable energy increases [42]. The concept is akin to earning frequent flyer miles, but instead of flying, the reward is for producing and consuming clean energy. This approach not only incentivizes the generation of solar energy but also creates a decentralized and transparent mechanism for tracking and rewarding green energy production [43].

6.2. WePower

WePower is a blockchain-based platform that facilitates investments in renewable energy projects. The

platform tokenizes energy production, allowing individuals to purchase energy tokens that represent a certain amount of electricity [44]. These tokens can be used to buy electricity at a discounted rate directly from renewable energy producers or sold on the open market. This system provides financial returns for investors while promoting the use of renewable energy, thus helping to reduce reliance on fossil fuels [45]. By using blockchain technology, WePower ensures transparency and security in transactions, making it easier for investors to trust and engage in green investments. The platform's success demonstrates the potential of blockchain to revolutionize the energy sector by enabling more efficient and direct funding of renewable energy projects [46].

7. Risks and Considerations

7.1. Regulatory and Political Risks

Investing in green projects can be akin to navigating through unpredictable weather, as changes in government policies and regulations can significantly impact the success of these projects. Regulatory frameworks for green investments, such as subsidies for renewable energy or carbon pricing mechanisms, are often subject to political shifts and policy changes [47]. For instance, changes in administration or legislative priorities can lead to the reduction or elimination of incentives that were initially beneficial to green projects [48]. Moreover, the lack of a stable regulatory environment can create uncertainty, deterring investment and hindering the growth of the green sector. Therefore, investors need to stay informed about potential regulatory changes and understand the political landscape that could affect their investments. Proactive engagement with policymakers and participation in advocacy efforts can also help mitigate these risks [49].

7.2. Technological and Security Risks

While blockchain and fintech offer enhanced security and transparency, they are not immune to risks. These technologies, often compared to high-tech safes, still require constant monitoring and maintenance to ensure their security. Cyber-attacks, software bugs, and other vulnerabilities can pose significant threats to blockchain-based systems [50]. For instance, Decentralized Finance (DeFi) platforms have been targets of high-profile hacks, resulting in substantial financial losses [51]. Additionally, smart contract vulnerabilities can lead to unintended consequences, such as the loss of funds or unauthorized transactions. Investors need to be aware of these risks and take proactive steps to protect their investments, such as conducting thorough due diligence, utilizing secure platforms, and employing robust cybersecurity measures.

7.3. Liquidity Concerns

Tokenized assets, while providing innovative investment opportunities, might be harder to buy or sell quickly, similar to owning a rare collectible that not everyone wants. The liquidity of these assets can be limited due to the nascent stage of the market and the specific nature of the assets themselves. Unlike traditional financial markets, where assets can be easily traded, the market for tokenized green assets may lack sufficient buyers and sellers, leading to longer investment horizons and limited opportunities to liquidate assets quickly. Investors should be prepared for these liquidity constraints and consider them when planning their investment strategy. Diversifying their portfolio and maintaining a long-term investment perspective can help manage these concerns.

8. Conclusion

Fintech and blockchain technologies are revolutionizing the landscape of green investments, making it

easier and more secure for individuals to contribute to sustainable projects. By democratizing access to investment opportunities in renewable energy and sustainable agriculture, these technologies are driving the transition to a more sustainable economy. Fintech platforms simplify the investment process, offering user-friendly interfaces and transparent data, while blockchain ensures security and traceability, enabling investors to trust that their funds are used as intended. This democratization allows even small investors to participate in funding green projects, thus mobilizing the large amounts of capital needed to address global environmental challenges.

Furthermore, the stability and predictability of returns from green investments, particularly in renewable energy, provide financial security. These projects often operate under long-term contracts that guarantee steady income streams and offer protection against inflation. By investing in green assets, individuals not only secure financial returns but also contribute to positive social and environmental impacts, such as reducing greenhouse gas emissions and supporting local economies.

The integration of fintech and blockchain in green investments represents a significant advancement in the effort to combat climate change and promote sustainability. As these technologies continue to evolve, they will likely play an increasingly critical role in enabling a broader audience to participate in building a greener planet. The potential for innovation in this space is immense, and ongoing developments will likely lead to even more accessible and impactful ways for individuals to contribute to sustainable development.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

The paper is in partial fulfilment of PhD in Business Administration of the LIGS University USA by Lucílio Zunguze. He wrote paper and his supervisor approved it for publication.

Babandi Ibrahim Gumel is the thesis supervisor of Lucílio Zunguze at LIGS University, USA, and supervised the writing of the paper. His contribution includes editing, formatting, and writing the abstract of the paper.

References

- [1] D. W. Arner, J. Barberis, and R. P. Buckley, "The evolution of fintech: A new post-crisis paradigm?" *Georgetown Journal of International Law*, vol. 47, no. 4, pp. 1271–1319, 2015.
- [2] S. Nakamoto. (2008). Bitcoin: A peer-to-peer electronic cash system. [Online]. Available: <https://bitcoin.org/bitcoin.pdf>
- [3] D. Tapscott and A. Tapscott, *Blockchain Revolution: How the Technology Behind Bitcoin is Changing Money, Business, and the World*, Penguin, 2016.
- [4] C. Catalini and J. S. Gans. (June 2019). Some simple economics of the blockchain. NBER Working Paper No. 22952. [Online]. Available: <http://www.nber.org/papers/w22952>
- [5] Y. Chen and C. Bellavitis, "Blockchain disruption and decentralized finance: The rise of decentralized business models," *Journal of Business Venturing Insights*, vol. 13, e00151, 2020.
- [6] A. Kalair, N. Abas, and N. Khan, "Comparative study of HVAC technologies for renewable energy applications," *Renewable and Sustainable Energy Reviews*, vol. 59, pp. 403–419, 2021.
- [7] IRENA, *Renewable energy benefits: Leveraging local capacity for solar PV*, International Renewable Energy Agency, 2020.
- [8] S. E. Hosseini, A. M. Andwari, M. A. Wahid, and G. Bagheri, "A review on green energy potentials in Iran," *Renewable and Sustainable Energy Reviews*, vol. 20, pp. 249–263, 2019.
- [9] R. Fu, D. Feldman, R. Margolis, M. Woodhouse, and K. Ardani. (2018). U.S. solar photovoltaic system cost benchmark: Q1 2018. *National Renewable Energy Laboratory (NREL)*. [Online]. Available: <https://www.nrel.gov/docs/fy19osti/72399.pdf>
- [10] S. Borenstein, "Private net benefits of residential solar PV: The role of electricity tariffs, tax incentives, and rebates," *Journal of the Association of Environmental and Resource Economists*, vol. 4, no. S1, pp. S85–

S122, 2017.

- [11] J. Zhang, T. Wu, and M. Chen, "Technology roadmap for wind energy: A case study of China," *Renewable and Sustainable Energy Reviews*, vol. 81, pp. 1351–1365, 2018.
- [12] P. Veers, K. Dykes, and E. Lantz, "The evolution of wind turbine design optimization: From small clusters of turbines to large wind farms," *Renewable Energy*, vol. 139, pp. 1244–1256, 2019.
- [13] R. Wiser, M. Bolinger, and B. Hoen, "Wind power technology and performance trends," *Lawrence Berkeley National Laboratory*, 2021.
- [14] FAO. (2017). The state of food and agriculture. [Online]. Available: <http://www.fao.org/state-of-food-agriculture/en/>
- [15] H. Willer and J. Lernoud. (2017). The World of Organic Agriculture Statistics and Emerging Trends 2017. [Online]. Available: <https://orgprints.org/51877/>
- [16] H. Willer and A. Sahota. (2020). The world of organic agriculture statistics and emerging trends 2020. [Online]. Available: <https://orgprints.org/37557/>
- [17] D. P. Garrity, *Agroforestry and the Future of Global Land Use*, Springer, 2012.
- [18] C. E. LaCanne and J. G. Lundgren, "Regenerative agriculture: Merging farming and natural resource conservation profitably," *PeerJ*, vol. 6, e4428, 2018.
- [19] C. J. Rhodes, "The imperative for regenerative agriculture," *Science Progress*, vol. 100, no. 1, pp. 80–129, 2017.
- [20] R. Gibson, T. Stainforth, and A. Tam, "Fintech for sustainable development: How to drive the next generation of green finance," *European Commission*, 2019.
- [21] S. Bender, "The role of fintech in green finance," *Journal of Sustainable Finance & Investment*, vol. 11, no. 2, pp. 200–220, 2021.
- [22] B. Steffen, "The importance of project finance for renewable energy projects," *Energy Economics*, vol. 69, pp. 280–294, 2018.
- [23] P. Belleflamme, T. Lambert, and A. Schwienbacher, "Crowdfunding: Tapping the right crowd," *Journal of Business Venturing*, vol. 29, no. 5, pp. 585–609, 2014.
- [24] P. T. Lam and A. O. Law, "Crowdfunding for renewable and sustainable energy projects: An exploratory case study approach," *Renewable and Sustainable Energy Reviews*, vol. 60, pp. 11–20, 2016.
- [25] V. Simeonova and K. Hristov, "Crowdfunding and sustainable development: A case study of crowdfunding platforms in Bulgaria," *Journal of Cleaner Production*, vol. 231, pp. 231–239, 2019.
- [26] T. Ziegler, R. Shneor, and K. Wenzlaff, "Crowdfunding: Mapping the UK market," *Journal of Business Research*, vol. 122, pp. 77–97, 2021.
- [27] M. Rauchs, A. Glidden, B. Gordon, and G. Pieters, "Distributed ledger technology systems: A conceptual framework," *Cambridge Centre for Alternative Finance*, 2018.
- [28] V. Buterin, "A next-generation smart contract and decentralized application platform," *White Paper*, vol. 3, no. 37, 2014.
- [29] N. Szabo. (1997). The idea of smart contracts. *Nick Szabo's Papers and Concise Tutorials*. [Online]. Available: https://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOT_winterschool2006/szabo.best.vwh.net/idea.html
- [30] P. Jain, V. Sharma, H. Singh, "Blockchain and smart contracts for corporate governance," *International Journal of Information Management*, vol. 58, 102299, 2021.
- [31] D. Yermack, "Corporate governance and blockchains," *Review of Finance*, vol. 21, no. 1, pp. 7–31, 2017.
- [32] Z. Zheng, S. Xie, and H. Dai, "Blockchain challenges and opportunities: A survey," *International Journal of Web and Grid Services*, vol. 14, no. 4, pp. 352–375, 2018.
- [33] R. Bolton and T. J. Foxon, "A socio-technical perspective on low carbon investment challenges—Insights for UK energy policy," *Environmental Innovation and Societal Transitions*, vol. 14, pp. 165–181, 2015.
- [34] R. Wüstenhagen, and E. Menichetti, "Strategic choices for renewable energy investment: Conceptual framework and opportunities for further research," *Energy Policy*, vol. 40, pp. 1–10, 2012.
- [35] REN21. (2020). Renewables 2020 Global Status Report. [Online]. Available: <https://www.ren21.net/gsr-2020/>
- [36] V. Kothari and G. Barone, *Fundamentals of Inflation-Linked Bonds*, Wiley Finance, 2014.
- [37] C. Flammer, "Corporate green bonds," *Journal of Financial Economics*, vol. 142, no. 2, pp. 499–516, 2020.
- [38] G. L. Clark, A. Feiner, and M. Viehs, "From the stockholder to the stakeholder: How sustainability can drive financial outperformance," Oxford University, 2015.
- [39] C. E. Härtel and R. Mortensen, "Investing for impact: A strategy of positive social and financial returns," *Corporate Governance: The International Journal of Business in Society*, vol. 19, no. 4, pp. 631–648, 2019.

- [40] OECD, *Investing in Climate, Investing in Growth*, OECD Publishing, 2017.
- [41] D. Hales, "SolarCoin: A cryptocurrency incentivizing solar energy," *Renewable Energy World*, 2017.
- [42] M. Kouhizadeh and J. Sarkis, "Blockchain practices, potentials, and limitations in supply chain management," *International Journal of Production Research*, vol. 56, no. 1–2, pp. 223–238, 2018.
- [43] A. D. Vries, "Renewable energy: Not a bitcoin bullet," *Joule*, vol. 3, no. 4, pp. 870–875, 2019.
- [44] D. Galen, N. Brand, L. Boucherle, and K. Yeung, "WePower: Blockchain based green energy trading platform," *MIT Sloan School of Management*, 2018.
- [45] M. Iansiti and K. R. Lakhani, "The truth about blockchain," *Harvard Business Review*, vol. 95, no. 1, pp. 118–127, 2017.
- [46] P. T. Helo and Y. Hao, "Blockchain-enabled e-commerce supply chain: A conceptual model," *Journal of Enterprise Information Management*, vol. 33, no. 6, pp. 1218–1230, 2020.
- [47] B. K. Buchner, J. Brown, and J. Corfee-Morlot, "Monitoring and tracking long-term finance to support climate action," *OECD/IEA*, 2011.
- [48] P. Soderholm, "Modeling the economic impacts of environmental policy instruments on the energy sector: A review of the literature," *Energy Policy*, vol. 39, no. 10, pp. 5937–5950, 2011.
- [49] P. M. Hannam, F. M. Vermeulen, K. Stechemesser, and A. Wild, "A global climate change investment framework," *Nature Climate Change*, vol. 5, pp. 641–646, 2015.
- [50] M. Conti, S. Kumar, C. Lal, and S. Ruj, "A survey on security and privacy issues of Bitcoin," *IEEE Communications Surveys & Tutorials*, vol. 20, no. 4, pp. 3416–3452, 2018.
- [51] S. Werner, L. V. Hove, and S. Vergucht, "Security and trust in decentralized finance," *Journal of Computer Security*, vol. 29, no. 3, pp. 339–362, 2021.

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