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Special Issue - Role of Green Finance in Achieving Sustainability

Leveraging Blockchain Technology and Tokenizing Green Assets to Fill the Green Finance Gap

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Clean energy projects have difficulties accessing finance. The transition to clean energy and accelerating investments in green projects require a game-changing approach, groundbreaking infrastructure, and pioneering green financing strategies. This article discusses the potential of blockchain technology in filling the green investment gap. Use cases related to the application of blockchain in green projects are analyzed. Blockchain technology can provide security, transparency, auditability, and traceability and help fill the green finance gap.

I. Introduction

Since the emergence of distributed ledger technologies (DLTs), including blockchain technology, the financial industry has witnessed a revolution as they promise innovative decentralized solutions that could improve efficiency and transparency in many aspects (Centobelli et al., 2021; Naderi, 2021; Zhou et al., 2022). Blockchain technology has shown the potential to digitize the entire financial ecosystem. Integrating blockchain-enabled tokenization and finance could lead to a more green and sustainable future. To accomplish the Sustainable Development Goals (SDGs) set by the United Nations, new sources of finance and a broad spectrum of investors are required. Strategies on green financing must be changed, and the capability of new technologies needs to be taken seriously.

Green finance includes many financial products and services, such as green bonds, green investment funds, carbon market, and energy trading, alongside initiative financial institutions, including green banks and green funds (Taghizadeh-Hesary & Yoshino, 2019). Since public budgets in green finance are insufficient, the market must change its approach to accelerate the flow of capital and investments to green projects. Therefore, finance flows to green and sustainable investment should seize the attention of policymakers. Innovative financial instruments and new capital sources are needed to enable green finance to achieve global green targets. The importance of green finance is highlighted in the wake of the COVID-19 pandemic, since the world is experiencing a drastic drop in new investments in green projects. Blockchain-based solutions can mobilize and scale private capital and facilitate crowd collaboration and retail investments in green projects by increasing security, transparency, auditability, and traceability (Yoshino et al., 2021). It is imperative to understand that these investment circumstances should not be hampered by conventional financial challenges such as inefficiency, lack of transparency, and complex procedures.

The G20 countries are expected to provide $97 trillion by 2040 for green infrastructure improvements and sustainable developments (UNOPS, 2019). Even before the COVID-19 pandemic, sustainable investments were insufficient and much lower than the required amount. Since the pandemic, in the case of developing countries, the $2.5 trillion annual SDG financing gap is predicted to increase due to global economic uncertainty (OECD, 2020).

The energy sector has severe challenges in the current expedition to power the globe in the post-COVID-19 era. The main challenges include high greenhouse gas emissions due to dependence on fossil fuels, difficulties in accessing finance due to the various risks associated with green projects, and the lower rate of return in green energy projects compared to fossil fuel projects. The practical adaptation of blockchain technology can address the difficulties in accessing finance, the most significant disruptor since the emergence of the Internet (Dorfleitner et al., 2021; Kowalski et al., 2021; Wang et al., 2021). Potential use cases of blockchain in green finance with an emphasis on tokenizing green bonds will lead the market to greater efficiency and transparency in green investments. Tokenizing green assets and crowdfunding will involve retail investors

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or donors in climate adaptation and sustainable finance. This paper aims to fill the literature gap on these issues.

The remainder of the paper is structured as follows. Section II answers the question of how blockchain can power green finance. Section III explains how blockchain-based firms nurture green finance. Section IV illustrates the tokenization of green assets and green bonds. Section V analyzes the challenges of the new approaches to green finance. The last section concludes the paper and provides policy recommendations.

II. How Blockchain Powers Green Finance

Blockchain technology, as fintech, provides various solutions for green finance and sustainable development (Schulz & Feist, 2021). Blockchain ensures the better tracking of green finance flows in real time. It takes sustainable finance to a new level through fund distribution. It also expands microfinancing and provides a matchmaking platform for investors and green project developers, helping green investment projects become a huge success.

In addition, blockchain can improve the carbon asset transaction system and provide global investors with a seamless and frictionless transaction solution. It can also make trading schemes more efficient through new approaches to price carbon credits and connect distributed carbon markets, besides decentralizing the trade of renewable energies and carbon credits. The efficient use of smart contracts in the process will also facilitate automation, high-speed execution, traceability, and transparency.

A. Blockchain Solutions in Green Digital Finance

a) **Reliable transaction recording:** One of the first reasons to incorporate blockchain technology into the financial sector is that it bestows an efficient and reliable platform to carry out and record transactions in the most authentic way possible. It enables asset ownership tracking. To be precise, blockchain makes energy trading less complex and highly credible.

b) **Elimination of intermediaries:** The smart contract in a blockchain automatically validates transactions that occur in renewable energy finance. This avoids the need for third parties in the process. It streamlines the shared trading platform for physical and financial trading with an assorted range of renewable energy commodities.

c) **Regulatory reporting and compliance:** At present, regulators in the sector demand renewable energy trading entities to submit comprehensive data to identify noncompliance and other regulatory deficiencies. With the available tools and methods, gathering and cleaning the data are an arduous task, and there is also substantial risk that the data could fall into the wrong hands. To eliminate all the troubles mentioned above, blockchain comes into play. It provides the utmost transparency, immutable data, and ideal ownership rights.

d) **Global supply network:** Under the current system, it is impossible to have an all-inclusive perspective of end-to-end processes in the sector. DLTs allow entities to share high-speed, productive, tamper-proof, and transparent information on an open platform without the anxiety of having their confidential and business-crucial information compromised.

III. Blockchain-Based Firms Nurturing Green Finance

The financial sector is quickly evolving. Many firms and initiatives are emerging and influencing green finance and sustainable growth, mainly providing innovative fintech solutions, tokenized green bond issuance, peer-to-peer renewable energy trading, carbon credit trading, and climate finance through crowdfunding (Cao et al., 2021). The following are some of the prime blockchain-based initiatives analyzed in the literature that accelerate green finance and sustainable investments.

Stockholm Green Fintech is a non-profit organization conceived to strengthen green finance and investments through groundbreaking fintech solutions. High ambitions in green finance and sustainable investments support innovations and emphasize solutions within the green fintech community. This independent platform stimulates, conceives, and promotes solutions for the green transformation of the fintech industry.

Climate Chain Coalition is an accredited observer organization whose commitment is to advance collaboration. It engages a multi-stakeholder group to mobilize climate finance; facilitate networking, research, governance, and demonstrations; and support the DLT applications and related fintech solutions to address climate change.

Project Genesis is a green bond issuance prototype launched by the Bank of International Settlements Innovation Hub and the Hong Kong Monetary Authority. It is a digital platform combining DLT to tokenize assets infrastructure focused specifically on governments green bonds. It is based on a private blockchain that offers a transparent secondary market for retail investors, so that anybody can download an app and easily access safe government bonds that will develop a green project.

Green Asset Wallet is the first blockchain platform for validating and reporting financial impact. The platform is exclusively designed to provide transparency, efficiency, and trust in the green debt market. It bridges sustainable investors with green investment privileges through blockchain. By scaling the green debt supply, Green Asset Wallet makes sustainable investments accessible for potential investors.

WePower is a platform that establishes robust connections among energy suppliers, corporate buyers, and energy producers by providing effortless green energy transactions. With the power of blockchain, it makes energy sourcing as simple as online shopping. The platform provides a high degree of flexibility in signing direct energy contracts. WePower sees blockchain and renewable energy as the next mighty couple of the energy market.

Green Digital Finance Alliance is a combined effort of Ant Financial Services and the United Nations Environment Programme to unleash the potential of the fintech sector

by streamlining the requirements for sustainable development. The allies of pioneering financial and sustainable development institutions collaborate to provide timely actions with scaled opportunities.

IV. Tokenizing Green Assets and Green Bonds

Notwithstanding the significant growth in the green bond market, lack of transparency is one of investors' main concerns. Utilizing blockchain technology as a financial instrument will streamline the process of green finance with the utmost trust, transparency, cost reduction, mobilization, and immutable traits. Banks can list tokenized green assets in the primary or secondary market and make them accessible to small/retail investors through a public blockchain exchange or a stock exchange that supports security token trading. There will be no difference in the costs for bonds on the blockchain between a $10 and a $10 million investment, which will open up the green bond market to a broader investor base (HSBC & Green Digital Finance Alliance, 2019).

Tokenizing green assets and bonds will engage a wide range of investors in the market and make it possible to involve more individuals interested in sustainable investment. A couple of related solutions in green finance are analyzed in this paper, as follows.

Bonds as a service: Many platforms provide do-it-yourself (DIY) bonds, which permit the issuers to build their own blockchain-based green bonds at reduced cost. DIY bonds allow investors to build and manage their portfolios without intervention or guidance from a professional financial advisor (HDFC Bank, 2022). The new platforms can offer these bonds via the issuance of security tokens. They help small or medium-sized enterprises or communities to issue green bonds without a bank's traditional costly services.

Fractional asset ownership: One of the greatest use cases of tokenizing green assets is it provision of fractional asset ownership. Green bonds and other assets can be converted into smaller units and owned by the investors. Amalgamating fractional asset ownership with automated reporting, small investors will be able to supervise the real-time progress of their investments.

V. Challenges of the new approaches to green finance

One of the main challenges in the renewable energy sector is the lack of accurate regulatory frameworks. The lack of competitiveness pushes these projects to be highly dependent on regulations. For instance, commitments to high-priced payments, priority access to electricity grids, essential infrastructure investments, and the guaranteed purchase of the outputs are critical reasons why the projects depend on the regulatory frameworks to proceed.

Governments must develop and enact regulatory frameworks to make sustainable finance more efficient and transparent, since this is one of the significant challenges in developing green digital finance, particularly in tokenizing green assets. In addition, excessive risk taking, overseeing the operation of markets, fraudulent activities, and technology-related risks are other crucial grounds for the uncertainties. The prevailing frameworks were designed with conventional securities, and brand-new classes of renewable energies and their trading applications therefore remain unclear.

VI. Conclusion and policy recommendations

Blockchain technology provides viable solutions to enhance and stimulate sustainable investments. Though one part of the world likes the taste of cryptocurrencies, the tech community, on the flip side, is exceptionally motivated to take part in a more sustainable world that ensures transparency, accountability, and a high sense of emergency. Green digital finance is quickly evolving as many initiatives emerge and influence green finance and sustainable growth. However, most of them are at the early stages of development. Still, if they are supported by appropriate regulation, they can effectively facilitate and improve green investments, especially in the areas mentioned in this paper, such as mobilizing private green finance, tokenizing green bonds, expanding the coverage of microfinancing, directing private capital to the best-matched green investment projects, bringing transparency to the system and reducing uncertainties, improving the carbon asset transaction system, supporting the tracking and reporting of carbon emissions, facilitating the trade of renewable energies, and enhancing financial flows.

Policymakers and financial regulators should establish an international framework for applying blockchain in sustainable finance, such as tokenizing green assets and issuing green bonds, trading carbon credits and renewable energies in a decentralized and transparent ecosystem, and decentralizing crowdfunding for green projects. Blockchain can pave the way for initiatives in this field and bring about greater certainty and acceptability for investors.

The recommendation for future studies is to run an empirical analysis using real data to assess the effectiveness of blockchain technology in reducing finance costs and risk in the green sector.

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