



Bridging the gap: Financial inclusion and the rise of green fintech for sustainable growth

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Abstract

Financial inclusion and sustainable finance are increasingly seen as essential elements for achieving inclusive growth and environmental stability. The emergence of Green Fintech—a convergence of financial technology (Fintech) and sustainability—has introduced innovative pathways for promoting equitable access to financial services while supporting ecological objectives. This paper examines the relationship between financial inclusion and sustainable finance, focusing on the role of Green Fintech in fostering environmentally responsible economic systems. It explores how digital financial innovations such as blockchain, artificial intelligence, and green digital banking contribute to inclusive and sustainable development. The study highlights both the opportunities and challenges associated with Green Fintech adoption and underscores the need for regulatory frameworks, technological literacy, and ethical finance to achieve global sustainability goals.

Keywords: Financial inclusion, sustainable finance, green fintech, digital banking, environmental sustainability, financial technology, inclusive growth

Introduction

Over the past few years, the Financial systems worldwide have shifted significantly due to technology, sustainability and innovation of policies. Financial inclusion is one of the key objectives of contemporary economic development as it guarantees that people and small businesses can afford to use convenient and affordable financial services (World Bank, 2022) ^[9]. Financial inclusion fosters equality, poverty alleviation, and entrepreneurship because it allows marginalized people to engage in formal finance (Demirguc-Kunt *et al.*, 2018) ^[2].

In line with this, the concept of sustainable finance has come into limelight as economies attempt to reconcile between growth and environmental responsibility. Sustainable finance is a term used to describe financial operations, which take into account environmental, social and governance (ESG) aspects of investment decisions and financial policies (OECD, 2020) ^[7]. A combination of financial inclusion and sustainable finance gives rise to what is currently known as Green Fintech- a merger of digital finance and sustainability. Green Fintech provides technological innovation to create a wider range of financial availability and solve climate change, resource efficiency, and social equity (Nguyen *et al.*, 2022) ^[6].

Financial Inclusion: A Ground-Breaking towards Fair Development.

Financial inclusion is the foundation of fair and sustainable economic development and in particular in developing and emerging economies where a significant proportion of the population continues to be unreachable by formal financial services. It guarantees that people and small businesses have affordable and secure financial products in the form of savings account, credit, insurance, pensions, and online payment systems. Financial inclusion, when properly undertaken, can increase economic participation, decrease income inequality and increase resistance to financial shocks.

The Global Findex Database (World Bank, 2022) ^[9] notes that approximately 1.4 billion adults in the world are unbanked, i.e., they lack the account with a financial institution or mobile money service provider. This exclusion curtails entrepreneurial activities, savings, and social security especially to the disadvantaged groups women, rural populations and the low-income earners. Financial inclusion is thus an issue or concern not only about access but also about empowerment - people get to make informed economic choices, accumulate assets, and make future plans.

Over the past few years, the financial environment has undergone change through the use of digital financial services. New products like internet banking, e-wallets and online payment systems have made the conditions of transactions cheaper and increased access even in distant places. An example is mobile-based payment solutions such as M-Pesa in Kenya and Paytm in India that have helped transform access to money transfer and credit facilities among the low-income groups (Jack and Suri, 2016) ^[5]. These online models have not only helped their users to save and transact safely, but also encouraged small entrepreneurship by making micro-lending and online markets possible.

The benefits of financial inclusion to macroeconomic stability and national development are that it mobilizes savings, increases consumption, as well as facilitates the formation of capital. Nevertheless, there are still obstacles to overcome, and the biggest challenges are digital illiteracy, awareness, gender differences, and ineffective infrastructure. In this case, especially women still experience socio-economic limitations that restrict their economic contribution. It needs a multi-stakeholder effort between governments, private banks, fintech firms, and civil society organizations, to overcome such challenges. The key components of reaching the target of finance for all in a sustainable and inclusive setting are the strengthening of digital infrastructure, encouraging literacy, and the creation of inclusive and sustainable financial policies.

Green Transition and Sustainable Finance

Sustainable finance is becoming a revolutionary concept that can stabilize financial systems in line with environmental protection and climate resilience and social welfare. It describes the implementation of environmental, social, and governance (ESG) in investment and financial decision-making (European Commission, 2021) [4]. The essential aim of sustainable finance is to make sure that the development of the economy will not undermine the health of the planet or social justice.

The concept goes beyond the conventional financial profitability but a long term sustainability index, carbon reduction, promoting renewable energy, protecting biodiversity and promoting social inclusion. Banking institutions in the global economy are reconsidering their lending and investment policies in order to promote green activities. Green bonds, sustainability-linked loan, impact investing, and climate fund are some of the tools that have become essential in directing capital to environmentally friendly projects.

Green bonds, as an example, represent issued bonds to fund renewable energy and low-carbon projects and have seen their increase grow exponentially over the past ten years. According to the report of the Climate Bonds Initiative (2023) [1], the market of green bonds in the world had crossed USD 2 trillion mark indicating a significant shift towards sustainability-related financial instruments on the side of the investor. The green transition is also being supported by governments and central banks with fiscal stimulus, policy frameworks and partnerships between governments and the business.

Sustainable finance is also related to social sustainability and attention to human welfare, employment and gender equality. To attain inclusive development, micro, small, and medium-sized enterprises (MSMEs), especially those involved in engaging in environmentally-friendly business activities, must be supported. Nevertheless, there is a challenge of getting a balance between profitability and responsibility. Sustainable finance requires like-minded financial models incorporating economic efficiency and ethical integrity. There is therefore a dire need to see financial systems that are not only profit oriented but also purpose based such that the growth is inclusive, resilient and environmental friendly.

The Rise of Green Fintech

Financial-technology and sustainability have met, creating a new area called Green Fintech, a novel field, which is centered on innovation, greenness, and digital accessibility. Green Fintech can be described as the application of technology-based financial solutions, which will aid in achieving sustainability goals and enhance access to finance (Tan *et al.*, 2021) [8]. It fills the void between the digital transformation and the green economy, allowing individuals and institutions to be involved actively in the financial eco-approaches.

Green Fintech is working with a number of channels and instruments, such as:

- **Digital Green Lending:** Internet-based services that offer loans to fund renewable energy projects, electric cars or sustainable agriculture.
- **Sustainability in Blockchain:** Distributed ledger technology provides transparency in dealings, which

can effectively monitor carbon credits and determine the environmental impact.

- **Green Digital Banks:** Banks that apply ESG principles to their lending, investment and operational policies.

AI-Driven Sustainable Investments: AI tools that process data on ESG metrics to guide investors in making decisions beneficial to the environment.

Green Fintech is practiced all over the world. Ant Group and WeBank have created digital platforms in China that can encourage users to become more environmentally friendly by monitoring their carbon footprints and providing them with digital rewards (Zhang *et al.*, 2022) [11]. In Europe, Tomorrow Bank and Triodos Bank have become the first digital sustainability champions, and the only projects on which they can invest funds are those that produce quantifiable environmental and social impacts.

Green Fintech impact on Financial Inclusion

Green Fintech has taken an important role to promote inclusive and sustainable financial development. It uses digital innovation to increase access to finance to underserved populations and enhance environmental awareness.

To begin with, digital access enables individuals residing in remote and underserved regions to enter the official financial system without having to use physical bank branches. Small farmers and entrepreneurs can have access to micro loans through mobile-based green finance to create environmentally friendly businesses, including solar irrigation systems or organic agriculture (Nguyen *et al.*, 2022) [6].

Second, Green Fintech allows lowering the transaction costs and making financial operations easier and cheaper accessible to low-income customers. Artificial intelligence driven automated systems evaluate creditworthiness based on alternative data, including mobile phone habits, online shopping, and online payments; hence, involving the types of individuals who do not have a history of credit.

Thirdly, Green Fintech helps in the education of financial literacy and sustainability. Most of the platforms incorporate digital learning resources that educate the users on responsible finance, sustainable investment, and energy efficiency. Green Fintech fosters a financial empowerment culture in accordance with environmental ethics by integrating awareness and technology.

This two-fold concern of inclusiveness and sustainability allows developing a comprehensive model of development, in which the social and environmental objectives support one another. Finally, Green Fintech is not only increasing access to finance, it is redefining the way people think and put financial responsibility into action in a new world.

Avoiding obstacles and dangers of green fintech implementation

Although it has the potential to transform, Green Fintech has a number of difficult issues, which may hinder its development and effect.

Data privacy and cybersecurity is one of the issues of concern. With the growth of financial transactions on the web, there is a higher possibility of unauthorized access of data, cyber fraud and identity theft. It is important to make

sure that the collection and processing of customer information is carried out in an ethical manner and with informed consent and clear protection (World Economic Forum, 2023)^[10].

The other major threat is regulatory uncertainty. Most nations especially the developing economies do not have an elaborate law or guidelines that regulate the fintech activities in the sustainability sector. Lack of well delineated regulatory frameworks may deter investment and innovation. Furthermore, disjointed laws in different jurisdictions complicate the operation of international Green Fintech platforms.

The issue of the digital divide is also continuous. The disparity of access to smartphones, internet connectivity, and digital education keeps marginalizing and rural populations out of the picture. The Green Fintech benefits might only continue to be the preserve of urban and privileged people with no proper digital infrastructure and awareness.

Policy and Institutional Implications

To begin with, there needs to be a balance between innovation and consumer protection in policy frameworks. It is important to encourage fintech startups to explore and at the same time to protect data privacy, ethical application of AI, and environmental friendliness. Governments can hasten this by developing national green finance policies, providing tax subsidies on sustainable investments and research and development of climate-finance technologies.

Second, funding digital infrastructure (such as the existence of a high-quality internet connection, secure payment service, and cloud-based data solutions) is essential to facilitate the mass adoption of Green Fintech. The policies of governance of data must specify the ownership and rights of use, and the consent to ensure the privacy of users.

Thirdly, there should be capacity building and green financial literacy. Schools, non-governmental organizations, and financial technology institutions ought to collaborate to create awareness of digital finance and sustainability. Green financial systems will be better used by informed consumers.

Lastly, the public-private partnerships (PPP) may play a central role in the scaling of the Green Fintech solutions. Governments, central banks, fintech startups and multilateral development institutions can collaborate to make investment in green infrastructure, renewable energy, and digital inclusion. To illustrate the latter, projects such as the Sustainable Digital Finance Alliance by the United Nations environment program (UNEP) show how cross-sector collaboration can help to make technology environmental and socially responsible.

Conclusion

Sustainable finance and financial inclusion are two pillars of sustainable and inclusive development. Green Fintech integration provides an unprecedented chance to increase access to finance and at the same time, be eco-friendly. Green Fintech can help the world meet the Sustainable Development Goals (SDGs) of the United Nations, especially in its targets on poverty alleviation, gender equality, and climate change.

Ethical governance, information protection, and diversity policies should guide Green Fintech to attain its full potential. All governments, financial institutions, and

technology providers need to collaborate to make sure that digital financial innovation is beneficial to every part of the society and preserve the planet. Finally, the Green Fintech is the future of finance, digital, inclusive, and sustainable.

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